INDUSTRY & WELDING

JUNE 1957

THE NEED: A tough little truck that could be airdropped.

RESULT: The first spot welded aluminum truck chassis.

■ *see page 47*

More than 40,000 welding buyers use this issue for practical help with their welding problems

FC FRANCHISE IN CIRCULATION

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

QUALITY JACKSON PRODUCTS

New 'Quik-Trik' Cable Connectors by Jackson

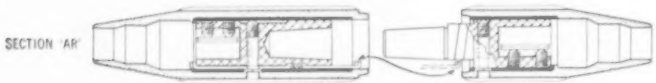
New Neoprene rubber insulators, strongly built around steel sleeves, have tapered ends to stretch over the welding cable snugly. They lock out moisture, oil and dirt, don't catch against obstructions.

Economical to install. No capital equipment is needed, no time consuming vulcanizing. Simply loosen an Allen screw, slide off the insulator and slip it over the cable end. Then connect the cable as usual, either mechanically or by soldering or brazing. Slide back the insulator and tighten.

Model 2/0-R, as illustrated, takes cables 1/0 and 2/0, mechanical, soldered or brazed connection.

Model 4/0-R takes cables 3/0 and 4/0, soldered or brazed connection only.

Section BR (male) of model 2/0-R can be used with section AR (female) of model 4/0-R where the use of different sizes of cables may be desired.



Really 'Quik-Trik'

For a quickly detachable connection, there never was a better metal-to-metal contact than is provided by these smoothly machined tapers drawn tightly together. And now, these new Neoprene insulators are tapered together in the same way. With a twist of the hand, a steel locking bar rides a cam to lock the sections together.

Always fasten section AR (female) to the cable leading from the machine. The live cable end is then well insulated even when detached from section BR (male).

The new Neoprene insulators are recommended for use with the 2/0 and 4/0 Quik-Trik Connectors now in service.

CHECK NOW. Look over your welding cables for costly current leaks and makeshift connections. You'll be money ahead by having Jackson's Ground Clamps, Cable Connectors, Splicers and Lugs stand guard against power losses and accidents all along your cable lines.

Jackson Products

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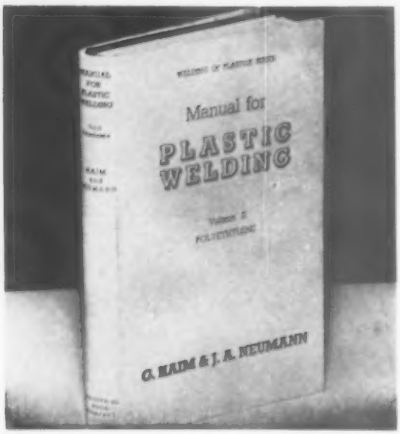
PLASTIC WELDING



VALUABLE NEW DATA

During the last few years gas welding of plastics has been applied with particular success to a large and ever-increasing variety of constructions where it has proved invaluable. Information on this subject is rather scarce. This manual will be extremely valuable to practical welding people and to engineers who intend to incorporate plastic materials into their designs.

PRICE $6.00

Industry & Welding

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WELDING

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Editorial and executive offices: 812 Huron Road, Cleveland 15, Ohio.

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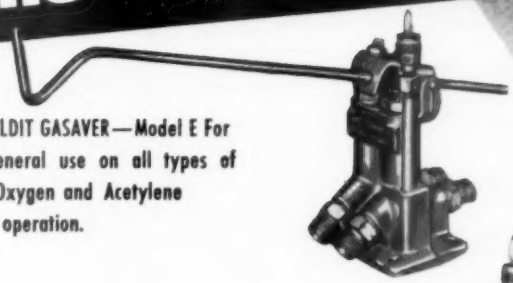
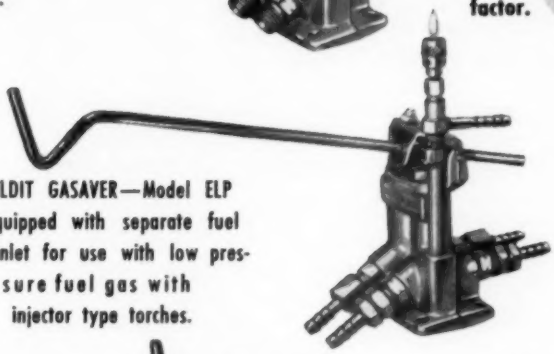
AFFILIATED PUBLICATIONS: Aeronautical Purchasing, Applied Hydraulics, Commercial Refrigeration & Air Conditioning, Flow, Material Handling Illustrated, Modern Office Procedures, Precision Metal Molding, Welding Illustrated. Member BPA. Accepted as a controlled circulation publication at Fostoria, Ohio.

NOW! NEW USES for the WELDIT GASAVER!

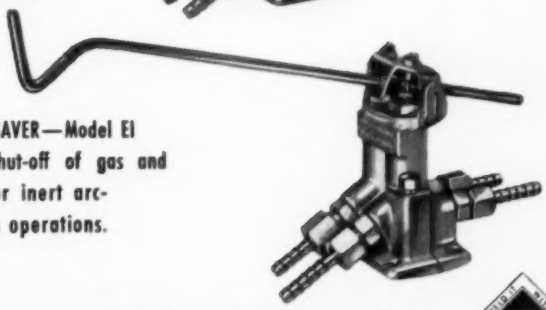


WELDIT GASAVER—Model E For general use on all types of Oxygen and Acetylene operation.

The WELDIT Gasaver is the original gas saving method of cutting production costs and elimination of idle flame is an important safety factor.



WELDIT GASAVER—Model ELP Equipped with separate fuel inlet for use with low pressure fuel gas with injector type torches.



WELDIT GASAVER—Model EI Positive shut-off of gas and water for inert arc-welding operations.

Canadian Dist. Alloy Metal Sales, 181 Fleet St., E., Toronto 5, Ont.

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THIS MONTH IN INDUSTRY & WELDING *June, 1957 Volume 30 No. 6*

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No. 33 "Solo goggle" with adjustable elastic headband.

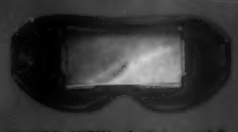
A "Picture Window" View and Maximum Safety for BRAZING, CUTTING, GAS WELDING, GRINDING and similar hazards.

COOL LIGHT COMFORTABLE

This NEW single-cup "Solo goggle" fits easily over Spectacle goggles and personal prescription glasses *for extra protection.* Molded of light, rugged plastic, "Solo goggle" is flame resistant and non-irritating to the skin. A *patented spring retainer* makes the filter lens and cover glass easy to change. The spring is of one-piece design . . . SAFE because it has no sharp ends or edges. "Solo goggle" affords a full, unobstructed view of work! *Order this newest and best eye protection NOW from your Safety and Welding Distributor!*

EXCLUSIVE Solo goggle FEATURES:

1) Wide "Picture Window" vision.
2) May be worn slightly off-the-face . . . with no annoying spring pressure.
3) Headrest has *padded* Leather or Leatherette Sweatband, smooth for comfort, easy to replace at low cost . . . and
4) Wide Range Ratchet Adjustment to fit all head sizes.
5) Uses standard 2x4¼" Lenses . . . easily replaceable without tools.
6) Entirely SAFE . . . no spring ends or edges in eye zone!
7) Headrest with positive, single center adjustable linkage . . . for simplicity and less weight.
8) Fits over all glasses.



INSIDE VIEW of "Solo goggle" . . . showing *patented* (Designed for Safety) positive retention spring. Lens easy to replace.

No. F-550 "Solo goggle" . . . with Headrest for easy or ventilated off-the-face wear. Wide Range Adjustment fits any head size.

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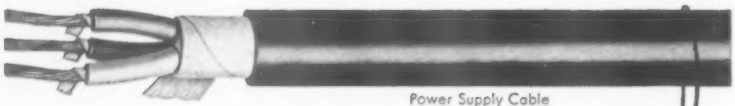
Power Supply Cord

If it's worth engineers' time...



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NEW IMPROVED HARD FACING

Tough, hard ceramic coatings provide superior bearing surfaces

Sprayed alumina forms "sapphire-hard" surfaces highly resistant to wear, abrasion and corrosion. Ideal for bearing surfaces, seals.

Development of the new METCO THERMOSPRAY GUN for spraying high-melting-point ceramic materials at low cost opens up a variety of new practical applications. One that has produced a great deal of interest is the use of sprayed alumina coatings for bearing surfaces and mechanical seals. This THERMOSPRAY 101 Ceramic Powder produces surfaces with a hardness of 9.0 on the Moh scale, (only the diamond rates 10.0) with excellent resistance to wear, abrasion and corrosion. When used in combination with special phenolic or furane plastic sealers it provides superior protection against many acids.

Another THERMOSPRAY Powder – 201 – is zirconia which is somewhat softer than No. 101 but provides superior heat-insulating properties. Melting point of this material is 4600° F. and particle hardness 8.0 on the Moh scale.

Hard-facing alloys of the self-fluxing, nickel-boron-silicon type in powder form can also be applied with the METCO Type P THERMOSPRAY GUN. These coatings may be fused, semi-fused, or left unfused depending on the hardness desired, from RC 30 to RC 65, depending on the alloy and the process used.

The new THERMOSPRAY GUN operates without compressed air, only oxygen and acetylene being required. The free-flowing THERMOSPRAY powders are fed to the flame nozzle from a hopper atop the gun, melted and propelled to the surface to be coated. These materials are sprayed many times faster (up to 15 sq. ft. per hour—.010" thick) than has been possible with equipment previously available. Deposit efficiencies are in excess of 95%. These factors result in extremely low coating costs.

Preliminary engineering data contained in Bulletin 127 covers ceramic coatings while Bulletin 126 covers the hard-facing alloys. Either or both may be obtained by filling out the coupon below or writing on your company's letterhead. No obligation, of course.

The following trade names are the property of Metallizing Engineering Co., Inc. METCO®, THERMOSPRAY. *®Reg. U.S. Pat. Off.*

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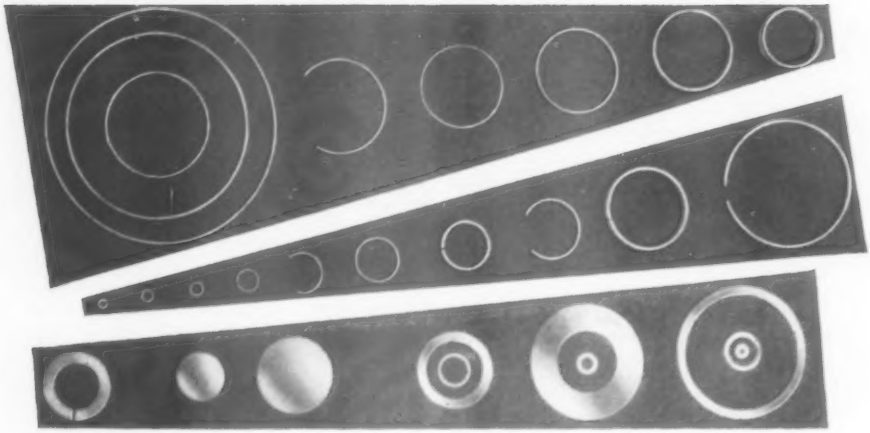

Pre-formed for your needs

GB *PRE-FORMED* Silver Brazing Alloys are available in the size and shape your job requires. Pre-formed shapes, like those shown, are designed for the joint. They assure strong, safe connections with a measured, minimum amount of alloy to save you time and money.

Write today for facts about efficient, economical GB 88 Flux and GB Silver Brazing Alloys in random coils, strip, pre-formed rings or special shapes.

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LETTERS TO THE EDITOR

COMPARISON CHART

Editor:

We would greatly appreciate five additional copies of "Hard Surfacing Comparison Chart," as compiled by Rankin Manufacturing Co., and shown in your magazine for October, 1956. If the supply is scarce one or two copies would be appreciated.

John D. Bert, *Welding Engineer*
Puget Sound Naval Shipyard

FUME DOOM

Editor:

Recently there was an article in INDUSTRY & WELDING magazine concerning a Mobile Fume Exhauster produced by the Engwald Corp., and we would like to have you notify them to furnish us a price on a unit for use in our welding department.

Exhauster should have a 220/440 volt a-c 60 cycle motor, or a 110 volt single phase a-c motor. The latter is preferred since it can be plugged into an existing wall outlet.

J. B. Kahlenberg, *P.A.*
Kahlenberg Bros. Co.

STAINLESS STEEL TUBING

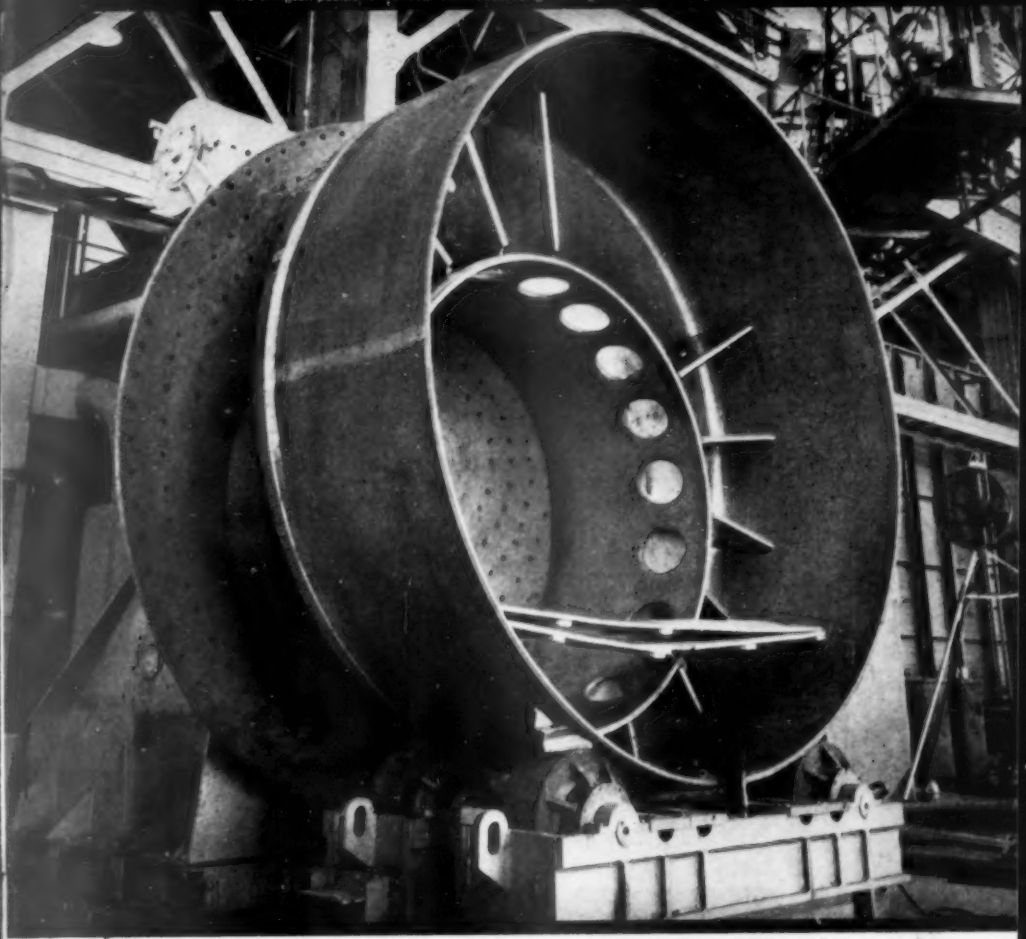
Editor:

May we kindly have one copy of "How We Weld Light Gage Stainless Steel Tubing" by Raymond Gardner, which appeared in the August, 1956 issue of INDUSTRY & WELDING.

A. E. Gunsolus, *Director Eng. Pub.*
Titeflex, Inc.

continued on page 12

Worthington positioner built for Combustion Engineering, Inc., Chattanooga, Tenn., handles loads up to 100,000 lbs.



Why are more weldments handled by Worthington than all other positioners combined?

THE REASONS ARE MANY

One is good service. With distributors in all principal cities a Worthington positioning specialist is nearby to help solve your welding problems. Conservative ratings are another. Worthington engineers its positioners to deliver year after year the rating stamped on the nameplate.

Knowhow and experience complete the list. Conceived in the fabricating shop of Ransome Machine Co.—later to become an operating division of Worthington—positioners were pioneered by Worthington people for more than 25 years.

Let us help you "position for profit." For useful data on the Worthington line of positioners, automatic welding head manipulators, turning rolls, head and tailstocks, write to Section Y-72, Worthington Corporation, Harrison, New Jersey.

WORTHINGTON

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LETTERS to the Editor

continued from page 10

WELDING MARKET

Editor:

We note in the Annual Directory of Industrial Marketing a reference to your publications described as "The Market for 12 Products Used by the Welding Department."

We are particularly interested in the market for resistance welders and associated equipment. Any available pertinent information would be much appreciated.

T.W.H. Stoddart, *Philips Canadian Industrial Devel. Co. Ltd.*

SOLDER ALUMINUM

Editor:

In your January, 1957 edition there was an article entitled "Solder Aluminum to Other Metals" by Kenneth V. Lutz.

We are interested in contacting Mr. Lutz and were wondering if you could provide us with his address.

Roy H. Smith, Jr.
Smithco Engineering, Inc.

WELDING COURSE

Editor:

Please send me full information on the correspondence course "Welding Fundamental Principles and Practices." Thank you.

Mr. Collin Edgerton

● *All requests for information and copies of articles contained in the above 'letters' were handled promptly.*

Alloys and Fluxes for SOLDERING FILLING SEALING ARC WELDING TORCH WELDING FURNACE BRAZING TORCH BRAZING

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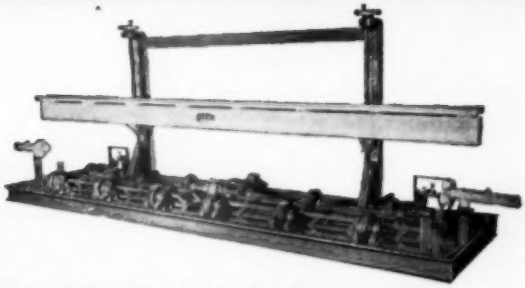
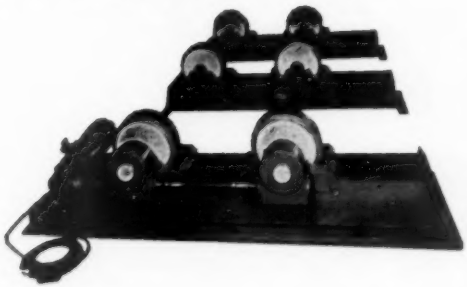
For Automatic Welding Head Carriages

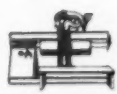


Increase production — use this fixture on 4' to 12' diameter work. Welding track is 24' to 34' long. Powered vertical adjustment is available for all models. May be used with your present turning rolls, welding positioners, special jigs for straight seam work, or portable type rolls illustrated below.



REED Portable Type TURNING ROLLS

For manual or automatic welding and other operations requiring rotation of a cylindrical vessel. Capacities range from 3 tons to 75 tons; larger units built to special order. Powered by electric motor with variable speed transmission. Readily portable, they may be used free or anchored to the floor as desired.



Horn Type Fixtures

Cylinder Flange Offsetters

Assembly Fixtures

Unit Type Turning Rolls

Portable Turning Rolls

Automatic Welding Track Supports

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REED EQUIPMENT DIVISION
THE WEBB CORP. WEBB CITY, MO. U. S. A.

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with P&H Low-Hydrogen electrodes

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P&H low-hydrogen electrodes give superior x-ray welds, with no porosity or cracking. Welds have exceptional strength and ductility through a wide temperature range, with as-welded properties comparable to stress-relieved.

Check P&H low-hydrogen rods for your really tough jobs — you'll find one to match the chemical or mechanical properties of any problem alloy you're handling. Write Dept. **316C**, Harnischfeger Corp., Milwaukee 46, Wisconsin.

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WELDING LIBRARY

CODE SIMPLIFICATION

"Unfired Pressure Vessel Code Simplified" (Robert Chuse, Leonia, N.J.) is a simplified analysis of the new 1956 A.S.M.E. Unfired Pressure Vessel Code. Written in easy-to-understand manner, compact 30-page book contains simplified charts for internal and external pressure, shell thickness, flanged and dished head thickness, flat cover plate thickness and openings and reinforcements.

Also included in the 1957 edition is a section on welding procedure.

Copies are available at $6.50 per copy from Robert Chuse, P.O. Box 91, Leonia, N.J. Single charts can be had at $1.00 each.

AVOID BRITTLE FAILURE

"Control of Steel Construction to Avoid Brittle Failure" (American Welding Society, New York City) is a manual prepared by the Welding Research Council. Volume analyzes researches dealing with notch sensitive properties of structural steel and summarizes available information and data of significance in design and construction.

Book is divided into three parts: Part I (Materials), Part II (Fabrication) and Part III (Design).

The 184-page book is copiously illustrated and indexed and sells for $4.50.

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MADE IN SHEFFIELD · ENGLAND BY JAMES NEILL & CO (SHEFFIELD) LIMITED

MA-3

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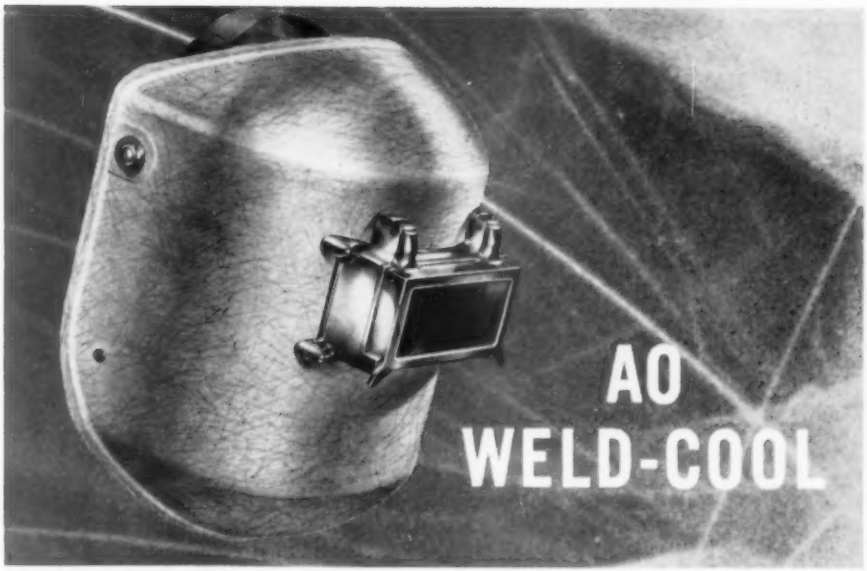

. . . the First White Fiber Glass Welding Helmet . . . COOLER-

REFLECTS 70% of Radiant Heat

Here's the answer to the plea for a cooler helmet . . . AO 9702-W and AO 9706-W Weld-Cool Helmets of Fiber Glass. They reflect 70% of radiant heat . . . keep welders 50% cooler, more comfortable, more efficient. Aluminized plastic coverplate, AO 168AL also available, provides exceptional coolness in eye area. Helmet is black *inside* to eliminate any possibility of diffusion of harmful light rays, and permit easy cleaning. Reflective, cool, aluminum glass holder. All helmets flame resistant. Stationary or lift front. Available with dark gray shell as No. 9702 or No. 9706.

New plastic, easy floating, rear adjustment, positive lock headgear. Adjustable friction joint. Exceptional ventilation. Adjustable vulcanized fiber chin rest for easy alignment of helmet in line of vision. Lightweight, exceptionally strong. Non-warping, moisture-proof, particularly recommended for inert gas, shielded arc and outdoor welding.

No. 9440
Vulcanized
Fiber Helmet

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS BRANCHES IN PRINCIPAL CITIES

For complete details on Weld-Cool helmets and American Optical's vulcanized fiber helmets, write for new brochure S-6311. Always insist on Ⓐ Trademarked Safety Products.

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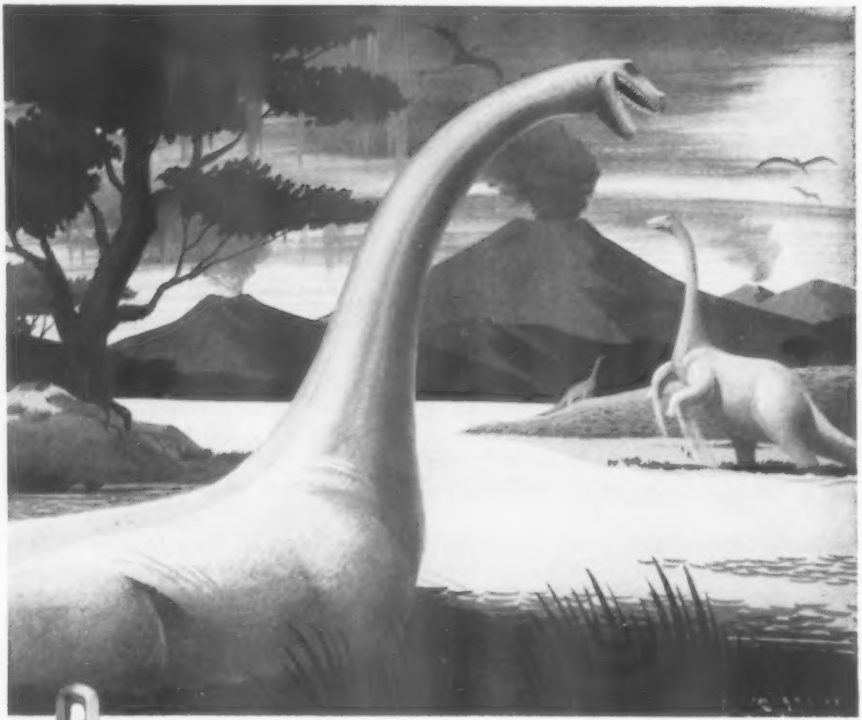


ASBESTOS — *fiber of the Ages!*

Through countless ages, when the world was in the making, asbestos, the wonder mineral, survived unchanged. Today, it is an important filler component of Norris-Thermador Acetylene Cylinders. Springy, long-fiber asbestos of the highest quality obtainable is used to bind and strengthen the other filler components of charcoal, diatomaceous earth and cement. Light in weight, this specially-selected asbestos also contributes to the filler's gas capacity, lightness and uniformity, as well as to the cylinder's greater serviceability and safety.

Note These Further Advantages of

NORRIS-THERMADOR ACETYLENE CYLINDERS

Cold-drawn construction...light-weight for easy handling...bases curled *under* for maximum strength and compact storage...larger cap holes...tags easily read without having to remove them...all welding x-ray controlled...specifications ICC-8 met and exceeded.

Acetylene cylinders from 10 to 300 cubic feet capacity.
Write or wire for specifications on all sizes. Cable Northerm.

NORRIS-THERMADOR CORPORATION
5215 SOUTH BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA, DEPT. IW-657

Circle No. 60 on Reader Service Card.

How a sand and gravel plant

SAVES UP TO $162 PER WEEK

Amsco® Semi-automatic S/A-53 Tube Rod . . . used in place of a competitive semi-automatic rod, is saving a large sand and gravel operator up to $162 per week on roll crusher hardfacing. And this is done with no loss of service life . . . no increase in welding time or rod consumption.

These roll crushers handle 3000 tons of gravel per week, work 10 days between hardfacings. Replacement rolls are hardfaced daily, using about 50 lbs. of rod.

Amsco S/A-53 Tube Rod is prehardened, pre-lubricated, high-chromium alloy rod for use in severe impact-abrasion service. It is designed especially for use with Amsco MF Semi-automatic Welders, but other machines may be easily adapted to accommodate its 3/32" diameter.

Write for Bulletin 656. Amsco Welding Products Department, Chicago Heights, Illinois.

Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS, JOLIETTE, QUEBEC

Circle No. 8 on Reader Service Card.

NEWS of the Welding Industry

LINCOLN EXPANDS

The world's largest plant for manufacturing welding electrodes and machines, The Lincoln Electric Company in Cleveland, blossoms out with new steel work under an April blizzard. Lincoln began in April to put up the first steel work for an $8,500,000 addition to its 5-year-old, 20-acre floor area plant. Capacity is being added to both the electrode and machine divisions to supply the rapidly expanding welding market. The new building will have under roof, on one floor, almost 30 acres.

AIR PRODUCTS NAMES LEWIS

Fred H. Lewis has been named assistant general manager, Cylinder Gas Division of Air Products, Incorporated. The announcement was made at Allentown, Pa., by Stanley Fey, general manager. The division manufactures all types of industrial gases.

Mr. Lewis is well known in the industry, having had many years of experience in the production and marketing of industrial gases.

PICKER, ANDREASEN COOPERATE

Picker X-Ray Corporation and Holger Andreasen, Inc., have announced that all Andrex equipment for industrial radiography will be distributed and serviced in the United States exclusively by Picker X-Ray Corporation. The new arrangement will enable present and prospective users of Andrex equipment to share sales and technical facilities of the nationwide Picker engineering and service organization.

AIRCO APPOINTMENTS

H. C. Wallace, district manager of Air Reduction's Louisville, Ky., sales office, has been named assistant regional sales manager of the

WALLACE

PEASE

Southern Region with his headquarters remaining in Louisville, Ky., it was announced by John J. Lincoln, Jr., regional vice president. A. C. Pease, assistant sales manager, Louisville, succeeds Mr. Wallace as district manager.

PEER TAKES OVER REX

All assets of Rex Welder Company, Kansas City, Mo., have been acquired by Peer, Incorporated, Benton Harbor, Mich., producers of resistance welding equipment.

President Alton B. Parrott of Peer, in announcing the acquisition, said his company's production facilities have been doubled as a result.

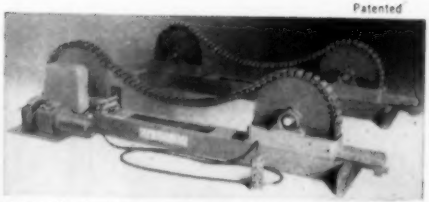
Manufacturing and engineering facilities now are concentrated at Benton Harbor. Peer will continue to market welding equipment under both brand names. No changes are planned in existing distributor organizations.

more news on page 123

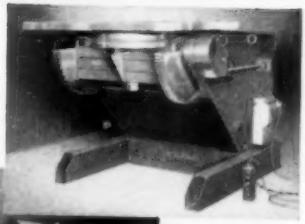
Aronson

Offers You Over 200 PROVEN Standard Stock Models of Quality POSITIONERS "POSITIONEERED" to your exact Requirements

Patented



Aronson TracTred (T. M. Reg.) Turning Rolls for thin-walled heavy cylindrical work to 27 tons capacity. Zero to 100 IPM turning speed and Built-In Grounding.

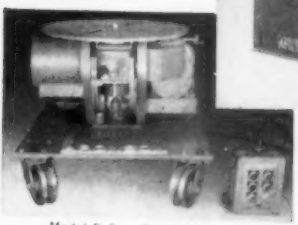


Heavy Duty Precision Built Rubber and Steel Tired Turning and Pipe Rolls, 100% overload protected. Capacities to 300 Tons.

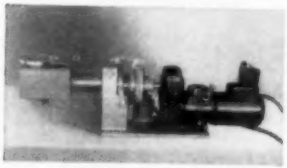
Fully Automatic Gear Driven Positioners, featuring Power Elevation, Tilting and Rotation. Capacities to 120,000 lbs.

Heavy Duty Gear Driven Positioners, with Magnetic Braking, Mercury Grounding, and Optional Speeds. Capacities to 120,000 lbs.

Heavy Duty Floor Turntables with precision speed control and Magnetic Braking, used for welding, burning, X-raying, etc. Capacities to 120,000 lbs., various heights and speeds.



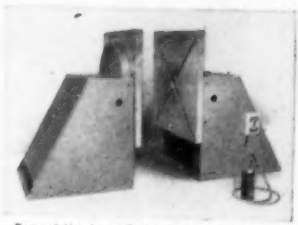
Model D Gear Driven Positioners. Compact. Precise. Rugged. Capacities to 1000 lbs.



Bench Turntable Automatic Positioners with Mercury Grounding Capacities to 500 lbs.

Patented

Aronson Universal Balance Positioners (T. M. Reg.) position your weldments effectively, instantly for downhand welding. Capacities to 2000 lbs.



Rugged Head and Tail Stock for positioning bulky weldments between centers. Table Backup for Zero Deflection. Magnetic Braking. Capacities to 160,000 lbs.

Aronson Twinner Permanent Magnetic Clamps, six models with thousands of uses in welding set-up work. Write for bulletin.

Write for detailed engineering data

Quality POSITIONERS by **Aronson MACHINE COMPANY**

ARCADE, NEW YORK

Circle No. 12 on Reader Service Card.

Great, New Custom Silver "W"

YOU CAN BE SURE... IF IT'S Westinghouse

Circle No. 93 on Reader Service Card.

Welder, by Westinghouse

HIGH FREQUENCY! A-C or D-C! ALL BY REMOTE CONTROL! — FAST!

This Custom Silver "W" *now delivers* —in *one* machine—*all eleven* aids to better, faster, easier welding, that recently were asked for by 2744 welding operators themselves!

You get straight AC welding at its finest. AC welding with high frequency automatically maintained — *ideal* for gas shielding! Or, high frequency utilized only at arc start. Moreover, your high frequency is varied in intensity, as you need it! All with *instantaneous* remote control!

You get DC welding with *full 375 amperes!*—assuring use of *bigger* electrodes! Still you have *immediate, constant* control of high frequency, as desired, for DC gas-shielded welding on the *lightest* work! And all by simple, exacting, remote control that *eliminates craters!*

Then, the Custom Silver "W" also gives you quick polarity selection—built-in, automatic water and gas controls (that clear the line both before and after use)—even an automatic timer for spot welding!

Yet above all this, the Custom Silver "W" incorporates the *easiest settings ever*, with the widest current range overlap in the industry! *Positive* instantaneous arc start, from the Westinghouse pre-energized reactor! And *utmost arc stability known!*—from the Westinghouse, exclusive smoothing reactor—and now from Westinghouse SILICON Rectifiers!

SILICON Rectifier Diodes 98% Efficient!

Hermetically sealed! Ageless! Unparalleled capacity! Give *unprecedented* arc stability, *absolute* depth of penetration desired, *lowest cost* welding now known! *Predicted soon to be copied throughout the entire industry!* J-22087-A

Accept complete information, help, from your local Westinghouse Welding Distributor!

Circle No. 93 on Reader Service Card.

LITERATURE featured in Ads this month

40 Complete specifications on AC/DC welders are available. HOBART BROS. CO. Page 1.

31 A new goggle for brazing, cutting, grinding, etc., described in Bulletin 53. THE FIBRE-METALS CO. Page 5.

55 New and improved hard-facing and ceramic coatings featured in Bulletins 126 and 127. METALLIZING ENGINEERING CO., INC. Page 7.

34 Preformed silver brazing alloys are subject of data book. GOLDSMITH BROS. Page 8.

11 Literature on flame-cutting machines available. AIR REDUCTION SALES CO. Page 9.

82 New catalog describes resistance welding electrodes. TIPALOY, INC. Page 10.

95 Data on positioners, head manipulators, turning rolls, etc., available. WORTHINGTON CORP. Page 11.

6 New folder explains use of nickel-silver solder. ALL-STATE WELDING ALLOYS CO., INC. Page 12.

38 Data on low-hydrogen electrodes for use on alloy steels provided. HARNISCHFEGER. Pages 14-15.

59 Descriptive literature on magnetic holders available. JAMES NEILL & CO. Page 16.

continued on page 26

cut weld cleaning time by 85%

Throw away your cold chisel and whisk off weld spatter with a dry rag! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time . . . P-O-M compounds quiet the arc, improve fusion and electrode operation, prevent oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.30 per gallon, f.o.b. Dayton.

P-O-M No. 8 Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of subassemblies. $3.35 per gallon, f.o.b. Dayton.

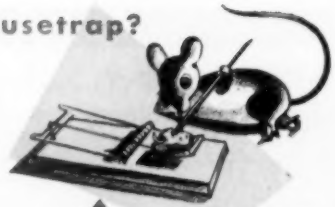
MONEY-BACK TRIAL OFFER
Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

PROTECT-O-METAL

G. W. SMITH & SONS, INC.
5402 KEMP ROAD, DAYTON, O.

Circle No. 70 on Reader Service Card.

How do you make a better mousetrap?



A recent coast to coast survey of all mice to get an answer to this age-old problem revealed a startling fact. The overwhelming opinion was that there was no need for a better mousetrap. It was found that the death rate of both male and female mice reached an all-time high in 1956. In some areas the situation had gotten so bad that prizes for the development of new style "Trap-Snappers" were being offered by local chapters of the Benevolent and Protective Order of Mice.

What does it take to make a better electrode holder?

Extensive interviews with weldors from coast to coast revealed that the rate of over-tired, worn-out weldors was on the increase. Much of this worn-out feeling was caused by the use of old style, heavyweight electrode holders. There was an overwhelming opinion that something needed to be done. The answer came from the weldors themselves. They wanted a holder that was lightweight, ran cool and was easy to attach to a cable. Now, weldors are finding the answer to their problems in the NEW AL-300 TWECOTONG Electrode Holder.

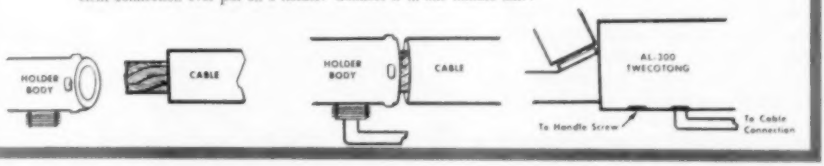
Lightweight

is accomplished by using *forged aluminum* in the tongs which weigh only half as much as copper tongs.

Cool Operation

results from the use of proper design and materials . . . pure copper jaws which are cadmium plated; the vise-like grip of the holder jaws on the electrode; and forged aluminum to carry welding current more efficiently than regular copper castings.

And to give Weldors everything they wanted, TWECO developed the ball-point screw method of attaching a holder to a cable. This new connection is the easiest to install, most electrically efficient connection ever put on a holder. Connect it in one minute flat!!



Tweco PRODUCTS, INC.

BOSTON AT MOSSET • WICHITA, KANSAS, U.S.A.

SEE IT NOW
at your local welding distributor. Buy it!

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LITERATURE IN ADS

continued from page 24

60 Complete specifications on acetylene cylinders published. NORRIS-THERMADOR CORP. Page 18.

8 Bulletin 656 describes a high-chromium alloy rod used in severe impact-abrasion service. AMSCO. Page 19.

12 Detailed engineering data available on quality positioners. ARONSON MACHINE CO. Page 21.

33 Bulletin GEA-6423 describes new motor-generator welder for difficult jobs. GENERAL ELECTRIC. Pages 30-31.

25 Bulletin 355-DC provides complete data on stainless steel welding wire. DRAWALLOY CORP. Page 33.

44 Welding flux recovery systems are subject of folder. INVINCIBLE VACUUM CLEANER MFG. CO. Page 34.

51 Complete particulars available on new gas welding equipment. THE LIQUID CARBONIC CORP. Page 37.

63 Folder DH-402A and Booklet DH-1277 describe submerged arc and inert gas welding wire and gas welding rods. Rod comparison chart also available. PAGE STEEL & WIRE. Page 45.

43 Answers to questions on electrodes and other welding equipment available. THE INTERNATIONAL NICKEL CO., INC. Pages 52-53.

39 Complete information available on hard-facing rods in coils, available in six alloys. HAYNES STELLITE CO. Page 54.

37 Bulletin 20 provides information on silver brazing, joint design and fast brazing methods. HANDY & HARMAN. Page 63.

the **ARC-TWIN** *Cuts Two Perfect Notches*

in *One* Downstroke of Press!

SAVING both time and cost, it gives you perfect T-joints — instantly ready for welding or brazing without deformation or finishing! Twin-acting punch shears clean, from inside out, leaving two matching notches (in perfect 180° alignment) with every downstroke of the punch press. Quickly interchangeable dies and punches accommodate pipe and tubing from ½" to 2⅛" O.D.; special units, up to 3" O.D.

Special Arc-Twins for double notching stainless steel or monel metal and units built to your specifications can also be furnished.

PATENTED

Ask for twin-notched sample of pipe or tubing

VOGEL TOOL AND DIE CORPORATION 1819 North 32nd Ave. Melrose Park, Illinois

Circle No. 86 on Reader Service Card.

More proof . . . how to get *consistent* results from submerged arc welding

Courtesy of CF Braun & Co
Engineers and Constructors, Alhambra, California

WELD WITH ARCOS

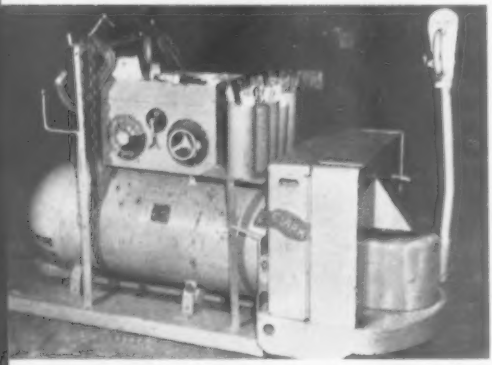
STAINLESS COILED WIRE

Unfailing strength and resistance to corrosion at elevated temperatures are vital in the welds of this massive 14 ft. diameter, 30 ft. long catalyst pressure vessel. All seam welding of the 1¼ Chrome ½% Moly plate was submerged arc welded with Arcos Chromar *welding quality* wire. Arcos Chromar wire—like every Arcos filler metal product—can be used with confidence on the most critical jobs. Start with Arcos and be sure of uniform dependable weld metal—from start to finish. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

Circle No. 11 on Reader Service Card.

WELDING AT WORK

Arc welding reached new heights at Waltham, Mass., when Mason's Welding took a welder to the 1100-foot level of a new giant WBZ-TV tower at Needham Heights, Mass. Done with low hydrogen electrodes, welding involved 99 feet of unsupported antenna on tower's top. Hobart welder used was purchased from Welders Supply Co., Cambridge.



Two inexpensive ideas pay off for Clark Equipment, Battle Creek, Mich., (left, above) and Baldwin - Lima - Hamilton Corp., Philadelphia (left).

Clark converted a battery-operated hand truck into a self-propelled mobile welding unit by bolting a 450-amp welder to it.

B-L-H devised a low-cost storage vault for Cobalt-60. Vault, which costs less than $200, substitutes for equipment which costs as much as $2700.

Spectacular truck accident damaged 200-psi liquid carrier tank but failed to cause cracks, leaks or flaws in either T-1 steel plate or any of the welded joints. Tank, which carried liquid propane and did not spill a drop, was Magnafluxed immediately after the accident. Tank was made by Mosher Steel Co., Houston, using automatic wire supplied by Page Steel & Wire Division.

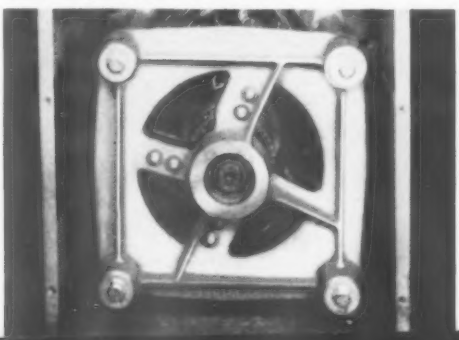
Automatic welder is used by Dravo Corp., Pittsburgh, to fabricate 8,000 gallon viscose blender designed by Dravo for a rayon producer. Operator's position is on the boom that carries the welding wire. This permits constant inspection of welds as turning rolls rotate workpiece. Uniform, high quality welds are obtained without losing time shifting heavy workpiece.

Announcing a new Look in M-G Welders!

New General Electric M-G Set Speeds Welding

CONSTANT-FORCE brush springs need no adjustment; give the correct constant pressure during generator brush life. Removable spring clips permit easy replacement of brushes.

STURDY CONSTRUCTION results from steel rods linking the bearing housings with generator and motor frames. Sturdy ¼ in. angles are welded to the generator frame to provide a solid base.



with Stable, Penetrating Arc — In Any Position

General Electric's new motor-generator welder gives you the stable, penetrating arc you need to get even those tough, out-of-position welding jobs done faster and better.

The secret? General Electric's NEW laminated frame welding generator, working in combination with a unique transformer reactor.

The arc is stable because this new reactor provides excellent control of current surges and assures immediate high recovery voltage at all settings. No need to worry about costly delays caused by electrode freezing or popouts.

A high level of "arc force", with the stable arc, makes the General Electric m-g set ideal for a wide variety of industrial applications, including light, medium, and heavy d-c metal-arc and inert-arc welding.

And here are just a few other reasons why the new G-E motor-generator welder answers your need for high-quality welds in less time; and at less cost.

EASY TO USE—current is not sensitive to changes in line voltage—once the simple current setting has been made, no further adjustment is necessary. Arc has quick response and good control in all positions.

FUNCTIONAL DESIGN—two welding sets can be installed in the space normally required by one, saving valuable floor area—brushes can be changed while welders are stacked—cooling air enters the ends, exhausts front and back, to prevent recirculation.

LESS MAINTENANCE—constant pressure brush springs give maximum brush life—rubber-mounted, extra-width, pre-lubricated bearings require no maintenance—motor windings are Mylar* insulated and Dri-Film† coated to help prevent insulation failures—heavy-duty motor starter contacts last for years.

General Electric's new d-c motor-generator sets are available in both 300 and 400 ampere designs, rated 40 volts, 60% duty cycle. For more information about them, contact your nearby General Electric Welding outlet, listed in the yellow pages of your telephone book. Write for descriptive bulletin GEA-6423 to Section 711-8E, General Electric Company, Schenectady 5, New York.

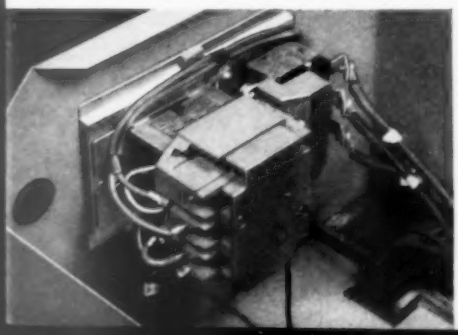
*Reg. Trademark of DuPont Co.

†Reg. Trademark of General Electric Co.

GENERAL ELECTRIC

IMPROVED MAGNETIC STARTER has quick response bi-metallic thermal overload relays to help prevent motor burnout in case of sustained overloads or accidental single phasing. Starter contacts are long-lasting, won't chatter.

DUAL CONTROL DIAL is fully calibrated, easy to read. Just select electrode size on Electrode Selector, then set sensitive long-scale current control for desired welding current. No subsequent adjustments are necessary.



NEW REFERENCE DATA

ENGINEERED TOUGHNESS is the way Sight Feed Generator Company describes deposits made with Rexarc hardfacing and manganese electrodes in their 18-page booklet now available. Recommendations are given for selection of proper electrodes and for procedures to follow in applying them for best results. **Circle No. 100 on Reader Service Card.**

WELDING EQUIPMENT of many kinds are described in the Raytheon Mfg. Co.'s bound and covered volume containing a 16-page catalogue, 2 technical data sheets, 3 application bulletins and 11 product data sheets. Steps in solving welding problems, a cause-symptom chart, AC and DC comparison tables, specifications, definitions, sample welds and specific product information are given with appropriate illustrations. **Circle No. 101 on Reader Service Card.**

LIQUID FUEL CUTTING TORCH is the subject of a four-page bulletin issued by Worcester Taper Pin Company. Torch uses such fuels as gasoline, benzine, alcohol and kerosene in place of gaseous fuels used for other cutting torches. Economy, safety, portability and quality of cut are advantages covered. **Circle No. 102 on Reader Service Card.**

PORTABLE 200-AMP ARC WELDER is described by Brennen, Bucci and Weber in a 2-color illustrated bulletin. This BREN/WELD product features a new UHF transoidal transformer that is responsible for the unit's portability. Specifications and suggested applications are presented. **Circle No. 103 on Reader Service Card.**

GENERAL PURPOSE GUN designed to take care of all your metal spraying applications is described in punched-bulletin issued by Metallizing Company of America. Gun, known as Mogul Turbo-jet, features a magnetic speed control and ability to use coating wires from 20 gauge to 3/16-inch, from the hardest to the softest metals. **Circle No. 104 on Reader Service Card.**

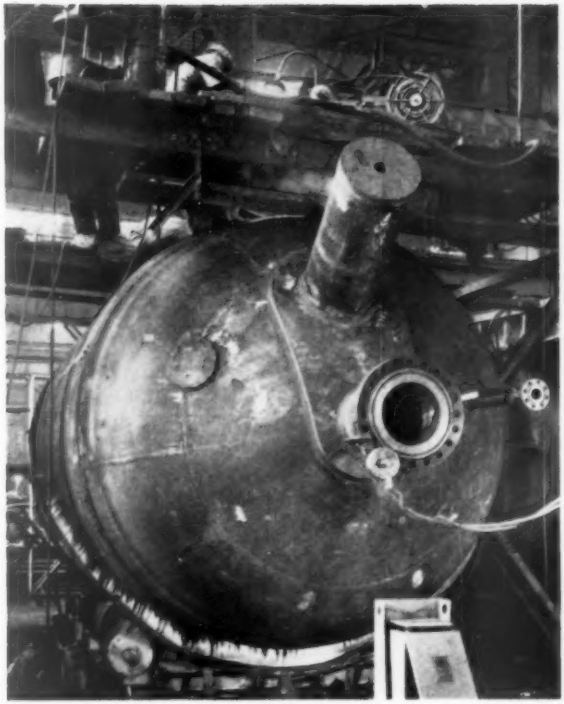
MARKING DEVICES, including steel stamps, holders and fixtures, are the subject of a new 4-page, 2-color bulletin published by M. E. Cunningham Co. Pictures, charts and data concerning the various devices take the guesswork out of ordering steel stamps. **Circle No.105 on Reader Service Card.**

PLASTIC WELDER, designed to make fabrication of P.V.C. plastics practical and economical, and a high-speed production method are described in a folder issued by The Sleelye Craftsmen. All data needed for making joints in material thicknesses up to 1-inch—equal to the material strength, are included. **Circle No. 106 on Reader Service Card.**

A 4-PAGE, PUNCHED FOLDER issued by the Buffalo Fire Appliance Co. graphically illustrates how new UL ratings are applied to Buffalo extinguishers. Since publication of the folder, two ratings have been increased: 15- and 20-lb CO_2 extinguishers have been rated 8-BC instead of 4- and 6-BC, respectively. **Circle No. 107 on Reader Service Card.**

SPOT WELDER CONTROL consisting of a three-phase frequency converter is the subject of a description and specification bulletin issued by Weltronic Company. Descriptions include timing circuits, heat controls, timing ranges and switches and special features. **Circle No. 108 on Reader Service Card.**

continued on page 35



When fabrication codes demand 100% X-ray inspection...

SPECIFY *Drawalloy* CORPORATION

Stainless Steel Welding Wire

In hundreds of applications, *Drawalloy* wire has been put to the test . . . X-ray, dye check, pressure and service and with the same consistent result—OK as welded. That's why Frank Iapalucci, Manager of Welding Engineering for Baldwin Lima Hamilton, Eddystone, Penna., selected *Drawalloy* chrome-moly wire for the automatic welds on this reactor. The vessel is constructed of A 301-54T Grade B firebox quality steel ranging in thickness from 5-1/16" to 2-5/8". *Drawalloy* 1-1/4 Cr, 1/2 Mo wire was used for all submerged arc joints.

When inspection by X-ray is required, don't gamble . . . rewelding is expensive . . . specify Drawalloy "quality controlled" wire. *Drawalloy* stainless steel welding wire is produced to strictly controlled specifications to provide the right chemistry, finish and temper for smooth operation in your equipment and to provide X-ray quality welds.

Why not discuss your stainless welding wire needs with your *Drawalloy* Distributor or Representative . . . a man ready to help you. Bulletin 355-DC provides complete information on every grade of *Drawalloy* wire. Write to: Drawalloy Corporation, Lincoln Highway West at Alloy Street, York 11, Pennsylvania.

DRAWALLOY
CORPORATION
YORK, PENNSYLVANIA

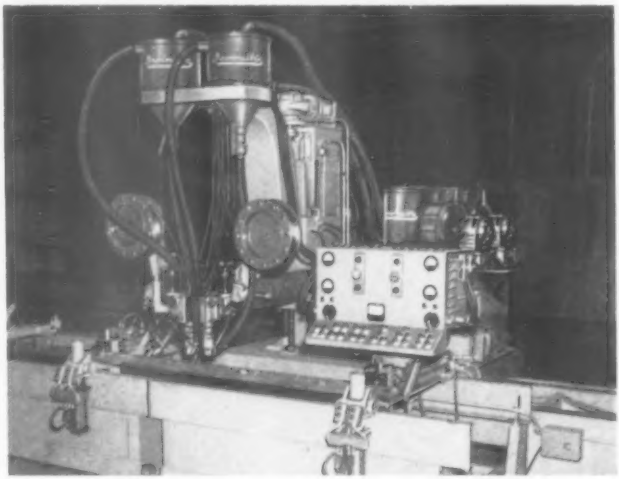
THE WIRE MILL FOR THE WELDING INDUSTRY — STAINLESS STEEL · HARD SURFACING · TOOL STEEL

Circle No. 25 on Reader Service Card.

Welding Fixture and Positioner Manufacturers Specify

INVINCIBLE

WELDING FLUX RECOVERY SYSTEMS



This special fixture is designed for an intricate, complicated weld — to fabricate all-steel foundry flasks. It is equipped with two welders and two Invincible Welding Flux Recovery Systems.

Because:

INVINCIBLES recover *all* unused flux on submerged arc welding jobs, remove powder and return slag-free, dust-free flux to the welder in a *continuous* flow. Savings in reclaimed flux *alone* repay their cost in a few months, or even weeks. And they save costly man-hours over manual methods, speed production, minimize costly rejects.

In 14 standard automatic and manual models from 1½ to 7½ H. P. *plus* special machines and combinations. All are compact, flexible, rugged.

Resident engineers in all principal cities.

SEND FOR FOLDER on Invincible Flux Recovery Systems

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

Circle No. 44 on Reader Service Card.

NEW REFERENCE DATA

continued from page 32

PORTABLE X-RAY UNIT, rated at 275 KVP and featuring lightweight transformer and tube head weighing only 65 lbs., is the subject of an illustrated folder issued by Triplett & Barton, Inc. Trailer-mounted and thoroughly tested in laboratory, factory and field, Tri-Ind-X is said to offer many unusual features. **Circle No. 109 on Reader Service Card.**

RESISTANCE WELDERS are featured in a brochure issued by Precision Welder and Flexopress Corp. Standard, semistandard and special machines for use in 12 basic industries are described in detail and illustrated. Bulletins are also available for each of the machines described in the brochure. **Circle No. 110 on Reader Service Card.**

DESIGN TIPS on how to take advantage of savings possible with stud welding are among the features of a new 24-page Design Manual now available from the Nelson Stud Welding Div. Gregory Industries, Inc. Manual contains full descriptions and physical properties of various stud types. **Circle No. 111 on Reader Service Card.**

HOSE CLAMPS, TOOLS, PARTS AND FITTINGS are the subject of a 12-page catalogue published by Punch-Lok Co. It also serves as an instruction and training manual. Separate sections are devoted to Punch-Lok methods, uses and applications. Tabular data are listed to assist in placing orders, and numerous photos illustrate the various devices available. **Circle No. 112 on Reader Service Card.**

MAGNETIC AIDS to speed production is the way James Neill & Company Ltd. describes their line of products in a 15-page booklet they have issued. Advantages and applications are listed for holders, adjustable links, material separators, indicator holding bases and sheet floaters—all employing magnetism as the force. **Circle No. 113 on Reader Service Card.**

A 4-PAGE BULLETIN issued by Acetogen Gas Co. compares company's "Acetogen" gas with acetylene both from a characteristics and an operational viewpoint. Inflammability limits of various gases are presented graphically; 22 applications and 10 advantages of "Acetogen" are given. **Circle No. 114 on Reader Service Card.**

HOW TO SLASH water bills up to 90% with a coolant control for spot, seam, projection and flash welders is explained in a bulletin from Van Vooren Products. Key to the cut is Water Mizer, which is claimed to eliminate overcooling and condensation, prevents low water pressure and provides full thermal flow switch protection, to name a few advantages. **Circle No. 115 on on Reader Service Card.**

A NEW BULLETIN published by The Babcock & Wilcox Co. is devoted to tube-bending operations involving steel tubing and pipe. The phenomena associated with bending, use of machines and bending methods are discussed and illustrated. Properties and bending characteristics of stainless and intermediate Croloys and of Nicloys are also presented. **Circle No. 116 on Reader Service Card.**

INDUSTRIAL GAS MANIFOLDS with automatic controls are described in a new 24-page Oxweld catalog now available from Linde Company, Division of Union Carbide Corporation. Recommended uses and specifications are given for selection of equipment for gas piping systems, including hydraulic backpressure valves of all types. Acetylene generators are also discussed. **Circle No. 117 on Reader Service Card.**

HOW TO PROTECT hands from most industrial hazards is explained in a new illustrated catalogue sheet issued by BOYER CAMPBELL Co. Company's "Skincote" creams, waterless hand cleaner and an economical, sanitary and practical dispenser are discussed. **Circle No. 118 on Reader Service Card.**

continued on page 36

NEW REFERENCE DATA

continued from page 35

FLUORESCENT PENETRANT INSPECTION Manual aimed at standardizing quality and reducing costs has been made available by the Magnaflux Corporation. This booklet is a "must" for inspection-minded people, because it not only gives the complete story on Zyglo and Zyglo-Pentrex inspection methods, but is profusely illustrated with examples of defects, strikingly highlighted by the use of fluorescent inks. **Circle No. 119 on Reader Service Card.**

AIR-POWERED SMALL-WHEEL GRINDERS, the 1170 series featuring 50% more power, are described in a new data sheet issued by Rotor Tool Co. Specifications of the various types available are listed, photos of each are included and 10 tool features are given. **Circle No. 120 on reader Service Card.**

HIGH TEMPERATURE brazing alloys and related materials of stainless steels and special alloys is the subject of an illustrated four-page catalog published by Stainless Processing Div., Wall Colmonoy Corp. Catalog discusses the characteristics and physical properties of Nicrobraz alloys. **Circle No. 121 on Reader Service Card.**

A NEW LINE of iron powder contact electrodes is introduced by Champion Rivet Co. in a 2-color folder. Details of current ranges, mechanical properties and deposition rate are presented in tabular or graphic form. Specifications and applications of four new "Speedemon" electrodes are given. **Circle No. 122 on Reader Service Card.**

RESISTANCE WELDING CONTROL line of the non-synchronous type is fully described in 12-page Bulletin GEA-6408 available from General Electric Company. Discussion includes typical application, use of plug-in control units and ignitron contactors and dimensions of various units. **Circle No. 123 on Reader Service Card.**

PRODUCTION polishing, buffing, grinding, wire brushing, deburring and microfinishing are the subjects of Acme Mfg. Co.'s new 2-color data sheet. Pictures and applications of both semi-automatic and automatic machines are given. Hand-operated equipment is also covered. **Circle No. 124 on Reader Service Card.**

BUILD UP ELECTRODE featuring increased welding speeds and smooth and uniform slagless welds is the subject of Service Bulletin from Industrial Overlay Metals Inc. Designated 4-45 to denote as-deposited and work-hardened Rockwell C hardness, electrode is said to be excellent as a base for hard facing. **Circle No. 125 on Reader Service Card.**

A VARIETY OF SMALL WELDING POSITIONERS from 75- to 500-lb capacity are featured in a new 8-page, 2-color brochure issued by Aronson Machine Co. Photographs, specifications, schematic drawings, accessories and applications of the various models are presented. Most data are in tabular form for easy comparison. **Circle No. 126 on Reader Service Card.**

PORTABLE SAND BLAST GUN which operates on 60 to 150 psi air pressure and throws a variety of abrasives for cleaning and etching metals and other materials, is described in an illustrated circular from Lindberg Products Co. Said to be efficient for sand blasting small parts, for removing scale, paint and dirt from hard to get at areas, gun performance is said to be comparable to large commercial machines. **Circle No. 52 on Reader Service Card.**

A NEW PORTABLE RESISTANCE WELDER, Model 57, is the subject of a 4-page bulletin issued by Ampower Products. Details concerning mechanical and electrical construction, timing unit and contactor, cooling, operational procedure, available accessories and operational hints are presented. **Circle No. 127 on Reader Service Card.**

continued on page 39

A NEW DIMENSION

New LIQUIDWELD line of gas welding equipment is not a warmed over design. It presents entirely new concepts in welding engineering . . . design in action, shock-proof performance, friction-free adjustment and new accuracy to meet modern requirements.

The new LIQUIDWELD Regulator shown here is a two-stage type. These regulators provide maximum flame stability through uniformly controlled delivery. Their simplified design minimizes maintenance — they have been tested and approved for greatest operating safety.

New LIQUIDWELD Regulators virtually obsolete your present equipment. They feature *Regulite* adjusting cap that gives finger-tip control . . . easy-reading gauges have colored faces with white calibrations . . . brass finish. In addition to regulators, both single and two-stage, the LIQUIDWELD line includes complete selection of torches and tips . . . expressly designed to be functional!

Write for complete particulars. LIQUIDWELD and GASWELD are divisions of The Liquid Carbonic Corporation, makers of famous Red Diamond Welding Grade Gases.

new All parts are machined from solid bar stock

new Diaphragms are made of special stainless steel

new Safeties are spring-loaded, self-reseating

new *Regulite* adjusting cap—rugged—gives accurate finger-tip control

new Nylon-pointed adjusting screw eliminates metallic friction

new Stabilized seats prevent freezing, vibration and seat ignition

Liquidweld

THE LIQUID CARBONIC CORPORATION

3100 South Kedzie Avenue • Chicago 23, Illinois

Branches and Dealers in Principal Cities • In Canada: IMPERIAL OXYGEN LTD., Montreal

Circle No. 51 on Reader Service Card.

CESCO...RIGHT—BEFORE YOUR EYES!

No.310-S
flash goggles

No.543-H Hat'N'Gogs
to fit over personal glasses
and give head protection

No.548-W
large cover goggles

No.545-W
cup-type goggles

No.407 welders
hand shield

No.424
inspection shield

No.410
helmet
for cramped
quarters

CESCO
Goggles & Helmets
combine utmost
in comfort and
PROTECTION

It pays to
buy them from
experienced
safety specialists.
Buy with
confidence
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ATLANTA, GA.
Guardian Safety Equipment Co.
4776 Moreland Avenue, N. E.

BATON ROUGE, LA.
Guardian Safety Equipment Co.
3615 Capitol Heights Ave.

BIRMINGHAM, ALA.
"L. P." Harless Company
2627 Seventh Avenue, South

BOSTON, MASS.
General Equipment Corporation
261 Franklin Street

BUFFALO, N. Y.
The Watson Company
1445 Main Street

CHICAGO, ILL.
Universal Safety Equipment Co.
5115 Diversey

CINCINNATI, OHIO
Williams & Co., Inc.
3231 Fredonia Avenue

CLEVELAND, OHIO
Williams & Co., Inc.
3700 Perkins Avenue

COLUMBUS, OHIO
Williams & Co., Inc.
851 Williams Avenue

DALLAS, TEXAS
Guardian Safety Equipment Co.
900 Jefferson Tower Bldg.

DENVER, COLORADO
General Welding Supply Co.
1434 Blake Street

DETROIT, MICH.
Averill Equipment Company
19225 Conant Avenue

HOUSTON, TEXAS
Guardian Safety Equipment Co.
1915 Westheimer

KANSAS CITY, MO.
Safety, Incorporated
17 E. 31st Street

KNOXVILLE, TENN.
Safety Equipment Distributing Co.
802 W. Main Avenue

LOS ANGELES, CALIF.
Guardian Safety Equipment Co.
7223 S. Main Street

LOUISVILLE, KENTUCKY
Williams & Co., Inc.
1109 S. Preston Street

MILWAUKEE, WIS.
Universal Safety Equipment Co.
3155 S. 70th Street

NEW YORK, N. Y.
(See ORANGE, N. J.)

ORANGE, N. J.
Guardian Safety Equipment Co.
400 S. Jefferson Street
(New York-New Jersey Area)

PEORIA, ILL.
Standard Industrial Products Co.
920 N. Garfield

PHILADELPHIA, PA.
Guardian Safety Equipment Co.
214 S. 45th Street

PITTSBURGH, PA.
Williams & Co., Inc.
901 Pennsylvania Avenue

ST. LOUIS, MO.
Safety, Inc.
2608 Olive Street

ST. PAUL, MINN.
Continental Safety Equipment, Inc.
1551 Selby Ave.

SALT LAKE CITY, UTAH
Universal Fire & Safety
Equipment Co., Box 1987

SAN MATEO, CALIF.
Guardian Safety Equipment Co.
220 Third Avenue

SPOKANE, WASH.
Spokane Safety Appliance Co.
North 219 Division Street

TOLEDO, OHIO
Williams & Co., Inc.
946 Kane Street

TULSA, OKLA.
Guardian Safety Equipment Co.
1742 S. Main Street

MEXICO CITY, D. F.
Safety Equipment S. A.
Sullivan #95

MONTREAL, CANADA
The Butler Optical Company, Ltd.
1520 Mountain Street

CHICAGO EYE SHIELD COMPANY
2334 Warren Boulevard
Chicago 12, Illinois

CESCO FOR SAFETY

Circle No. 19 on Reader Service Card.

NEW REFERENCE DATA

continued from page 36

PORTABLE GRINDER designated Model H is featured in punched-hole catalog sheet available from J & H Products Co. Specifications, standard equipment and optional equipment are covered, as well as complete information on another product, vibration dampeners. **Circle No. 128 on Reader Service Card.**

METALLURGICAL PUBLICATION put out monthly by Fansteel Metallurgical Corporation for disseminating information on refractory metals, tungsten, molybdenum, tantalum and columbium, is available from that company. This valuable information source covers such appropriate topics as x-raying of pipeline welds with versatile unit developed by Industrial X-Ray, Inc. **Circle No. 129 on Reader Service Card.**

REFILL IT YOURSELF LP gas torch which has a host of uses around the welding shop, is featured in an illustrated folder published by Goss Gas Inc. The refillability feature is claimed to result in 1/20th the cost of throw-away containers. **Circle No. 130 on Reader Service Card.**

PORTABLE, REMOTE CONTROL for arc welding machines is described in a four-page illustrated folder available from Worthington Corporation. Advantages claimed for the control include smooth, full range control at operator's position, maximum welding speed and crater elimination. **Circle No. 131 on Reader Service Card.**

GAS AND AIR production heating for brazing, soldering, annealing and hardening is said to be faster and better than other methods in Bulletin No. 511 published by Gas Appliance Service, Inc. Turntable and conveyor type units manufactured by the company are described and their advantages spelled-out. **Circle No. 132 on Reader Service Card.**

JACKS AND COUPLERS for mobile homes, trailers and industrial applications are described in a punched-hole, four-page catalog sheet put out by Hammer Blow Tool Company. Construction and applications of the many available types are covered. **Circle No. 133 on Reader Service Card.**

POSITIONER AND TURNTABLE CATALOG No. 88-57 is now available from Eisler Engineering Co., Inc. This 31-page catalog is chock full of all types, plus complete ranges of cams, Geneva gears, speed reducers and special machines. Catalog is profusely illustrated. **Circle No. 134 on Reader Service Card.**

ELECTRODE HOLDER REVOLUTION is claimed in illustrated Bulletin T 956 available from Martin Wells, Inc. Reason the struggle was worth it, states the bulletin, is because of the development of such features as slip-on insulator and currentless hinge pin and upper tong. **Circle No. 135 on Reader Service Card**

HOW TO RECLAIM FUSED WELDING FLUX FOR REUSE is explained in four-page Bulletin 157 published by the American Pulverizer Company. Capacities, and construction details for two crusher models are given, and typical installations limited. **Circle No. 136 on Reader Service Card.**

WALL CHART OF CONVERSION FACTORS has been made available by Precision Equipment Co. Included are common conversions such as inches to centimeters or watts to H.P., as well as, many conversions that are difficult to locate in reference manuals. **Circle No. 137 on Reader Service Card.**

continued on page 40

NEW REFERENCE DATA

continued from page 39

ELECTRODE, SOLDER REFERENCE Bulletin containing complete lists of products and properties for joining most ferrous and non-ferrous metals, is available from Eutectic Welding Alloys Corporation. Identification of filler materials, their main uses, bonding temperatures and properties are listed in tabular form, ideal for tacking-up. **Circle No. 138 on Reader Service Card.**

ALLOY ARC WELDING ELECTRODES for manganese steel welding are subject of a bulletin published by Alloy Rods Co. Physical properties and welding characteristics of "Super WH" electrodes are given in tabular form and are compared to heat-treated manganese steel plate and the best manganese steel electrode available. Typical applications are listed. **Circle No. 139 on Reader Service Card.**

A PLUG FOR WELDING is the way Joy Manufacturing Company describes their newly developed welding cable connector in an illustrated mail-back folder. Construction and advantages are fully covered. **Circle No. 140 on Reader Service Card.**

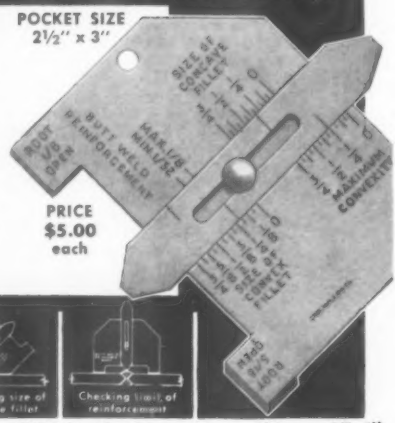
AN 8-PAGE DATA SHEET on Cr-Ni-Mn stainless steels made by The Allegheny Ludlum Steel Corp. is available. New family of austenitic stainless steels contains types 202, 204 and 204L, which possess high mechanical and corrosion-resistant properties; they use substantially less nickel than Cr-Ni types 302, 304 and 304L. **Circle No. 141 on Reader Service Card.**

WELDING FUME EXHAUSTERS for eliminating fumes created by arc or gas welding are described in an illustrated bulletin published by Engwald Corporation. The W-200 series described is said to be efficient because of a large-opening cone hood which allows fumes to be drawn off by means of a heavy-duty pressure blower, before they can circulate through the area. **Circle No. 142 on Reader Service Card.**

USE THIS "*Quick and Easy*"
PALMGREN WELD GAUGE
for accurate calibration of Butt and Fillet Type Welds

Meet exacting specifications of butt and fillet type welds with the Palmgren "easy to use" weld gauge. Precision built of chromium steel with dimensional readings clearly indicated, this handy, pocket size tool will help you eliminate rejections and save time and electrodes. It will accurately check sizes of convex or concave fillets as well as permissible tolerances of butt weld reinforcements. Conforms to A.W.S. specifications. Every production welder should have this weld gauge in his pocket. Order several for your shop today.

POCKET SIZE
2½" x 3"



PRICE
$5.00
each

122

USED MANY WAYS

Checking size of convex fillet
Checking tolerance of convexity
Checking size of concave fillet
Checking limit of reinforcement

CHICAGO TOOL & ENGINEERING CO. • 8373 South Chicago Ave., Chicago 17, Ill.

Circle No. 22 on Reader Service Card.

The K-G

light • rugged • dependable

M38 TORCH

all popular lengths, head angles, and lever types available

THIS new M38 cutting torch is designed specifically to give you years of satisfactory and economical service under the toughest shop or field conditions. You can use your M38 for every hand cutting operation . . . using any of the great variety of K-G tips available for standard and special applications.

- rugged, well-balanced construction
- non-fatiguing grip
- sensitive, high-pressure oxygen control
- resistance to heat and impact distortion

The M38 defies flashback. Its design makes it virtually maintenance-free. Ask your K-G distributor to demonstrate the M38, or write to K-G.

the K-G equipment company, inc.

a unit of Air Products, Inc.
PO Box 538 Allentown, Penna.

Circle No. 47 on Reader Service Card.

They're REINFORCED . . . they have longer life, they do more jobs!

Norton BFR and BD wheels bring the "Touch of Gold" to your light and heavy grinding

These two Norton developments — BFR and BD reinforced hub-type wheels — cover an almost endless list of weld shop grinding operations. And their extra versatility, economy and resistance to breakage add the profit-building "Touch of Gold" every time they go to work for you.

Learn more about what these fast, strong, money-saving wheels can do for you. The folder "*From Roughing To Finishing*" contains complete information on the semi-flexible BFR and the rigid BD — including operations, wheel sizes, operating speeds, recommendations and prices. Ask your Norton Distributor for it or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

W-1795

NORTON ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones • Behr-cat Tapes

Circle No. 61 on Reader Service Card.

FOR LIGHT WELD GRINDING. The BFR wheel is a soft-action, semi-flexible hub-type, containing cotton fabric and an additional Nylon layer. It's ideal for blending contours and corners . . . removing rust and scale . . . scarfing and beveling before welding . . . reaching hard-to-get-at places.

FOR HEAVY WELD GRINDING. The BD hub-type wheel, reinforced with glass cloth plus Nylon, is rigid. Made in three grades of hardness for best performance on your tougher jobs, such as smoothing flame-cut edges and stainless steel welds . . . slotting, notching and cutting-off operations . . . removing light fins from castings.

Circle No. 61 on Reader Service Card.

Why this test assures you of
TROUBLE-FREE TORCH PERFORMANCE!

Trial by fire and water — that's how MARQUETTE pre-tests *every* oxy-acetylene torch before it is shipped . . . and then you know, you're sure of safe, dependable performance.

That's our test of quality and design — MARQUETTE quality and design that demands: stainless steel for heat barriers; stainless steel valve stems; stainless steel cutting heads; the lightweight strength of aluminum for torch handles, and silicone "O" rings for positive seals.

To you, these features mean a virtually indestructible torch, precision built to last year after year.

You can select from MARQUETTE's 3 brilliant lines of oxy-acetylene and cutting torches; Aero-Jet, Star-Jet, and Super-Jet. Individual color-coded, speed-change Welding Tips fulfill all welding requirements.

New Jet-Flow Regulators feature simplicity of design, providing long, trouble-free service.

Get all the facts on MARQUETTE torches from your Welding Equipment Distributor or write for our new Oxy-acetylene catalog, No. 8094.

MARQUETTE

MARQUETTE MANUFACTURING CO., INC.

Dept. 7-619 • 307 East Hennepin Ave. • Minneapolis 14, Minnesota

Circle No. 54 on Reader Service Card.

PAGE offers 3 big advantages

PAGE has unsurpassed facilities, experience and special skills for drawing and furnishing the right wire for your welding applications. We are ideally equipped to manufacture wire to any desired size, temper or surface finish.

We purchase our raw materials to rigid specifications; we select heats of steels for optimum characteristics—then, upon delivery and before processing, we analyze samples for conformity with our specifications. Thus, PAGE is *the one supplier* in a perfect position to control the chemical and physical properties of its product *from billet to rod to wire!*

1 Wire to Fill Your Needs —Wide Analysis Range

The PAGE line contains 26 *different analyses*, covering the field of applications: heavy automatic submerged arc...light manual submerged arc...inert gas manual ...automatic, tungsten or metal arc.

AUTOMATIC WELDING WIRE

CARBON STEEL...Any carbon from Armco (.025 max.) to high carbon (.70-.84)

LOW ALLOYS...All the most popular welding grades

STAINLESS...All standard AISI grades. Other types on request

GAS WELDING RODS

PAGE Gas Welding Rods have long been recognized as the standard of quality, uniformity and dependable performance. These rods, in an exceptionally wide range, are furnished in coils, on reels or in 36-inch lengths, in the following materials: medium or high carbon steel, mild steel, Armco, low alloy, stainless steel, manganese bronze, naval bronze.

BARE ELECTRODES

PAGE Bare Electrodes are available in any carbon from Armco to high carbon (.70-.84).

METAL SPRAY WIRE

PAGE Metal Spray Wire is supplied in: any carbon from Armco to .80 carbon, low alloy, stainless steel, manganese bronze, naval bronze.

2 PAGE Packaging Means Protection and Convenience

Wrapped Coils... Coils in Cartons

Single and palletized coils, each coil steel-strapped and wrapped in waterproof paper...Also, single and palletized coils, in individual cartons.

Handy Reels

PAGE Inert Gas Welding Wire is available on 25-lb., nonreturnable palletized reels to fit all popular inert-gas welding machines. Wire is precision thread-wound.

Pay-off-paks & Leverpaks

PAGE *Pay-off-paks* permit *continuous feeding of wire up to 600 lbs.* (from 20" *Pak*) *or 850 lbs.* (from 23" *Pak*) *without rethreading.* Both *Pay-off-paks* and lightweight *Leverpaks* (*not illustrated*) give protection against distortion and corrosion...are easily opened, resealed, handled, stored. Palletized when requested.

Welding Wire in Coils

PAGE A-S Automatic Welding Wire is regularly furnished in layer-wound coils with cardboard liner, four Signode straps for easy coiling and unwinding —palletized as necessary.

Gas Rod Packing

PAGE Gas Welding Rods are supplied in 36" lengths in 50-lb. bundles, paper and burlap-wrapped. Also in burlap-wrapped coils and 150-lb. (approx.) reels. Stainless rods also available in 10-lb. fibre-board cartons.

3 Prompt Delivery from Local Stocks

PAGE automatic arc welding wire and oxy-acetylene welding rods are readily available from PAGE warehouses shown at bottom of this page—and from a nearby PAGE Distributor, wherever you live. Your PAGE Distributor saves you time by filling your needs promptly from his stock. This helps keep your inventory investment down!

ACCO for Better Values

**Indicates PAGE warehouse stocks*

Send for These...

- **Folder DH-402A** • PAGE Submerged Arc and Inert Gas Welding Wire
- **Booklet DH-1277** • PAGE Gas Welding Rods
- **Welding Rod Comparison Chart**

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

ACCO

Monessen, Pa.*, Atlanta, Chicago*, Denver*, Detroit, Houston* Los Angeles*, New York, Philadelphia*, Portland, Ore. San Francisco*, Bridgeport, Conn.

Circle No. 63 on Reader Service Card.

12 Powerful New Air Grinders

★ 50% more power ★ Fewer parts ★ Weight cut down ★ Interchangeable parts ★ Available in 4 speeds

THOR introduces the No. 4 series air grinders—12 new tools more powerful, lighter, and more foolproof than any ever offered.

What a choice! Your pick of four models with butterfly throttles, four with grip throttles and four with lever throttles.

Each of the three types is available in speeds of 4,500, 6,000, 9,000 and 12,000 r.p.m. Thor also offers a complete line of grinder accessories. Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

Thor PORTABLE POWER TOOLS

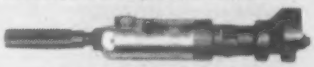
THOR POWER TOOL COMPANY, CHICAGO

Branches in all principal cities

Take your pick from the newest most complete, most versatile air grinder line anywhere.

5V VERTICAL GRINDER

7½ lbs. 4,500, 6,000, 8,000 r.p.m. Sanding discs to 9" diameter, depressed center wheels to 7", cup or wire brushes to 6". Power increased 50%. 4-position throttle.



25G DIE GRINDER

Weight only 2 lbs. yet develops 37% more power than its predecessor. Fewer parts. 20,000 r.p.m.

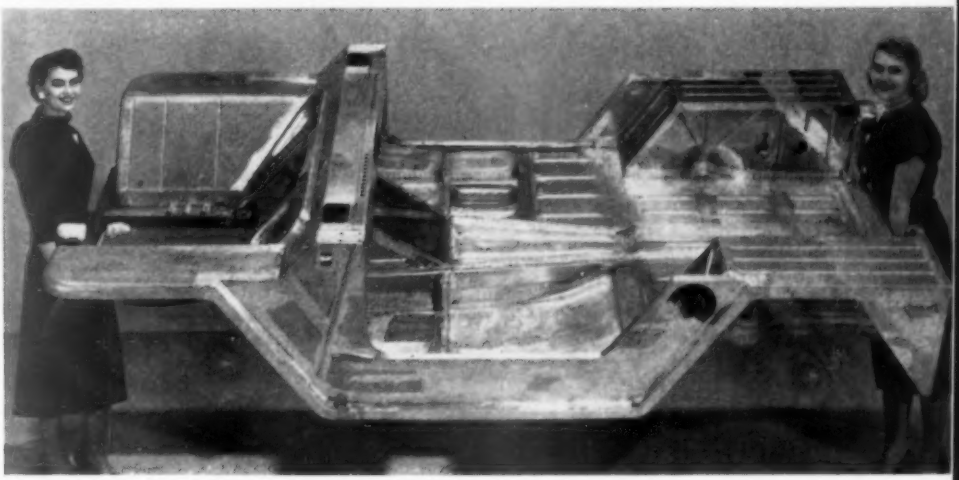
3G GRINDER FOR CASTINGS

3 lbs. 11 oz. 7,000, 10,000, 15,000, 18,000 r.p.m. available. Power increased 18%, weight decreased 16%. Wheel sizes 1½" to 3".

Circle No. 80 on Reader Service Card.

to get an air-dropable, floatable Army vehicle, Ford builds a

SPOT WELDED ALUMINUM TRUCK BODY



COVER STORY

THE automotive industry's first all-aluminum unitized vehicle body has been announced by Ford Motor Company. With the cooperation of Army Ordnance and Kaiser Aluminum automotive engineers, Ford engineers designed and built the body for a new experimental vehicle, known as the Ford XM-151-E.

Spot welded throughout, new vehicle has an aluminum integral body and frame structure. Welding was done according to military specifications developed to permit use of high production techniques.

Weighing only 124 pounds, vehicle is about one third the weight of steel body prototypes. Four-wheel-drive utility unit is also said to be stronger, more economical and better performed than any comparable military truck. It represents the latest phases of a developmental contract awarded to Ford by Army Ordnance five years ago. Steel as well as aluminum prototypes are included in the program.

Arc welding, stitching, riveting, and spot welding were considered as fastening means. Stitching and riveting were eliminated because they do not provide the rigid fasten-

SPOT WELDING is done with portable gun operated by 85,000

military spot welding specifications permit Ford's utilization of high production techniques

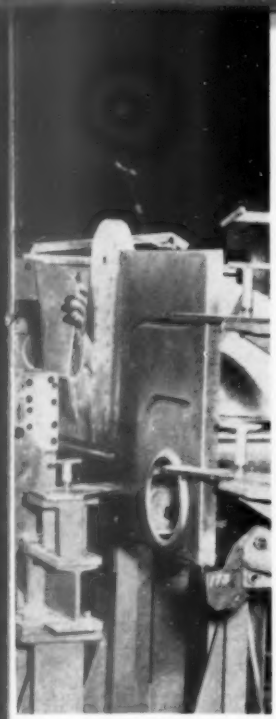
ing required for a structure of this kind. These fastening means will allow the joined materials to slip; thus secondary stresses will be induced in other members as critical members deform due to the slipping. Such a structure is not as rigid as a fixed joint structure would be.

Arc welding was eliminated because the heat cycle of arc welding would draw back the hardness in the heated zone, which would materially reduce the strength of the part.

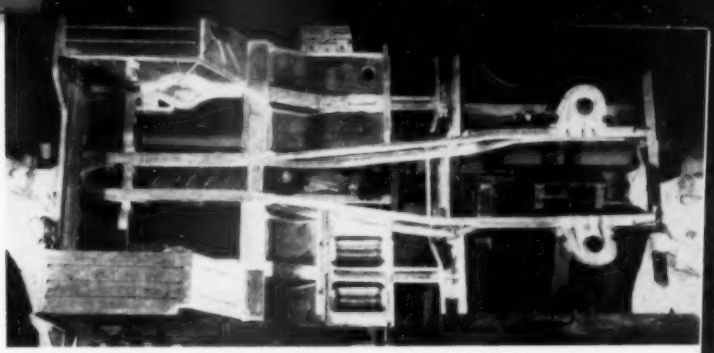
Arc welding also did not adapt itself to high production techniques which were to be considered in all aspects of this program.

Finally, spot welding was selected. The aluminum alloy chosen, 6061 T 4, will adapt itself readily to this method of fastening. The heat cycle and area of heat application of a spot weld is small enough not to affect the hardness of the adjacent material.

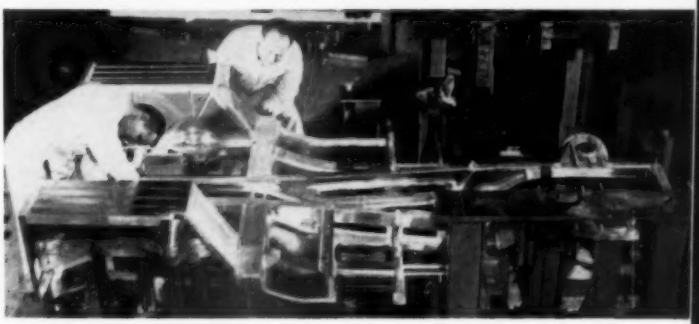
It is also believed that spot welding as a fastening means represented the least severe change in the production experience and background used in present steel body commercial production lines.



amp 3-phase transformer.



LITTLE EFFORT is required to turn or carry body.



INSPECTORS CHECK all spot welds in unitized body.

Since spot welding was selected as a fastening means, design was such that low efficiency of spot welds was anticipated. This meant that due to the additional difficulties of spot welding aluminum and to keep the welding on a production basis, perhaps as many as 50% of the spots made would be ineffective in holding the body together. To combat this possibility, it was established that the welds should not be in tension, should preferably be on the neutral axis of the section being fabricated, and should be in such a location that offers the greatest possibility of a successful weld being made.

In preparation for assembling the aluminum pieces into a body, a set of aluminum spot welding specifications was developed.

In order to insure that the welding procedure would adapt itself to high production, the following criteria were established:

1. The welds must be made without forging pressures.
2. There would be no certification of the welders or welds.
3. The quality of the welds would be determined solely by peel tests and nugget analysis.
4. Some practical method of precleaning the material before welding would be determined.

The latter point is most important since good welds in aluminum cannot be obtained once oxidization or film has coated the ma-

to get high current inside fixture . . .

Movable transformer and low magnetic field characteristics are important factors

terial.

It takes approximately 53,000 amperes peak secondary current to form a nugget of 180 to 200 thousandths diameter in spot welding two pieces of 60 thousandths aluminum together. To deliver such a high current inside a steel fixture presents the following problems:

1. The transformer should be movable so that it can be positioned within four or five feet of the area where the spot welds are to be made.

2. The type of equipment to be chosen must set up as low a magnetic field as possible in the surrounding steel structure of the fixture, and especially if the steel happens to be inside the loop of the gun.

In the past, stationary welders having a large diaphragm type pressure system have been successfully used to weld aluminum. The largest French manufacturer of railway cars has actually taken stationary welders and suspended them in adjustable bails from cranes over the parts to be welded. This is possible for large railway cars, but would be impossible for the type of construction as used in the body described.

To accomplish objectives, a three phase 250 KVA transformer was chosen. This transformer has a maximum output of 85,000 amperes sufficient to weld two gages of 102 thousandths aluminum. The voltage is adjustable though a step switch in two ranges: 13 volts and 26 volts. The transformer was mounted on a standard Lewis and Sheppard Stacker, which permits it to be moved close to that portion of the assembly fixture where the welds are to be made.

The Dekatron counting system was chosen to get a very consistent and perfectly timed output from this transformer, together with phase shift and slope controls.

Two pressure systems were provided:

1. A water hydraulic booster with a ratio of 1:24 and 1 inch pilot operated solenoid valve using input of 100 lbs. air pressure.

2. As a second system, a water hydraulic booster is provided but instead of 100 lbs. air pressure, an oil pressure of 1,000 lbs. is used on the input side of the booster. The output side has water pressure to eliminate any difficulty of leaking oil when changing portable guns.

The first pressure system will provide up to 2,000 lbs. electrode pressure. The second pressure system will provide up to 7,000 lbs. should forging pressure be needed. However, forging pressures were not required in the welding of the body.

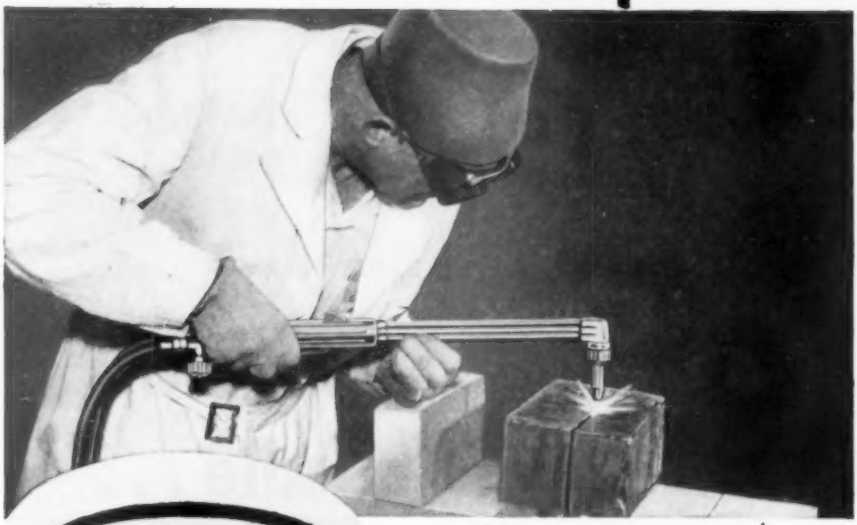
The portable guns were connected to the transformer using two 6 ft. long kickless cables in parallel, each having a 600 MCM cross section.

The chassis of a 36 inch large throat gun was fabricated from stainless steel in order to withstand the required high welding pressures.

Many sub-assemblies were made using a standard three phase 200 KVA Stationary Welder with a 48 inch throat.

continued on page 53

Light weight torch cuts 4" steel-*FAST*-at low pressures



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Nick gets the needle . . .
but the boys get the point!

I've known Charlie Grant for years. He's foreman of a shop that fabricates a lot of heat-treating equipment. A great guy! Always needling you!

A few weeks ago he invited me down to his shop to give his young weldors some tips on Inco Rod "A"* electrode. As soon as I opened the door, he began.

"Hey fellas," says Charlie, "look who's here! Nick Rodder! Pull up an electrode case, Nick, and tell us how to use the contents."

"Not much I can tell *you*", says I. "But have it your way."

"Enough of this", says Charlie, moving in for the kill, "How about giving us the *real* lowdown on this Inco Rod "A" electrode. We haven't been around too long, 30, 40 years."

Since Charlie had *asked* me to come, I figured I'd better go along with him.

"The first thing *you* ought to know, Charlie, is that Inco Rod "A" electrode can weld about 9 out of every 10 jobs involving dissimilar metals."

"I'll bet that will save me inventory costs," he whistles.

"Nothin' but truth and beauty ever flows from your lips," says I.

"But will it eliminate preheating?" asks Charlie, serious-like. There is a hooker in that question, but I'm ready.

"No! Although the Inco Rod "A" weld metal does not need a preheat, use of this electrode will not relieve the necessity for preheat where such preheat is required for protection of either of the base metals being welded."

"Tsk . . . tsk . . . tsk . . . all them big words," says Charlie. "Are you getting this fellas? And how about special welding techniques?" At this point

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Charlie squats on the floor and looks up at me like I am a great white father.

"Charlie," says I, "have you ever joined stainless?"

"Have *I* joined *stainless?* Why I've joined more . . ."

"Welding technique with Inco Rod "A" electrode is just about the same as you use in joining stainless," says I. "You can use the same arc length, rate of travel, angle of electrode. You'll get a spray-type arc which is spatter-free. You know what spatter-free means, don't you?"

"I have an idea," says Charlie. "But one thing bothers me. May I use alternating current with Inco Rod "A" electrode?"

"You may use A.C. if you want to be a plumber, Charlie, but it was developed for use *only* with direct current reverse polarity."

"You're saving me millions. What about slag removal? Is it easy?"

"As pie," says I.

"Fluidity?"

"Good . . . but not as fluid as steel weld metal. Any more questions? I'm willin' to do *all I can* to help you get a better grasp of welding practices."

Charlie *had* quite a few more. He let me have both barrels for about a half an hour. I'll tell you more about it next month. In the meantime, if you want answers to your questions on Inco Rod "A" electrode or any other Inco Welding Product *before* next month, write to me in care of Inco.

Yours for better welds,

Nick Rodder

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

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ALUMINUM BODY

continued from page 50

Making the spot welds of the wheelhouse inner panel and rear floor panel is a typical operation.

The first step is the wire brush cleaning of the material.

Then, the welding gun is prepared.

Sample strips of aluminum were used to make test welds to check the gun tip pressures, current output and timing. These spot welds in the strips were then subjected to button peel tests. These indicated approximately 1000 lbs. peel pull for this sample which was composed of two pieces of 60 thousandths material. The procedure of making test welds and button pulling was repeated before each sequence of welds was made.

The greatest difficulty experienced in spot welding the body was the cleaning of the pieces prior to welding. All the cleaning was done on the prototype body by wire brushing, which was adequate. However, many times two pieces would be cleaned, welded into a sub-assembly, and then no welding to these pieces would occur for several days. In the meantime, these pieces were handled, which required additional cleaning before welding another piece to them. By use of clean gloves, repeated cleaning of the sub-assemblies, and the use of extreme care, most of the problems were overcome.

In some cases, it was necessary to weld three panel thicknesses along the same overlap. After the first two panels were spot welded together, the third was spot welded to the other two by making the new spots directly over those joining the first two panels. In this manner, it was assured that oxidation, which may have occurred in

continued on page 70

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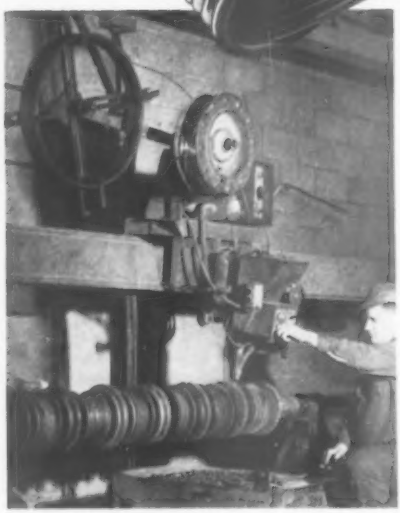

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an expert weighs pros and cons in answering this important question

IRON POWDER ELECTRODES: SUCCESS OR FAILURE?

by **D. L. MATHIAS**, consultant, East Orange, N. J.

IRON-powder electrodes have been one of the top items of discussion since their introduction several years back. Their merits have been widely discussed pro and con, and there are valid reasons for the divergent opinions that exist concerning their performance.

On those applications for which they have been found acceptable, they have been eminently successful. They have fulfilled most of the claims made for the types that were offered at the time of their introduction, the principal one of which was a substantial reduction in welding costs.

On the other hand, they have been flatly rejected for use on applications for which their weld quality was considered inadequate even though their cost reduction potentialities went unquestioned. Between these two extremes are those who have been unable to develop any real enthusiasm concerning their possibilities and have been content to let others pioneer their use before making a decision.

Little doubt exists that iron-powder electrodes are here to stay. However, many prospective users who subjected them to rather exhaustive tests following their introduction were keenly disappointed to find that they fell short of meeting the claims made for them. It is not unusual to find that exaggerated claims are made at the time a new product is put on the market. After its true worth has been established through actual use, or it has been modified to correct major deficiencies, it finally finds its proper niche and proves to be a valuable supplement to existing products. Such has been the experience with the iron-powder electrode.

If we review the order of introduction of the various types, we find that each succeeding type has shown a declining speed advantage over its conventional counterpart. Rather than presenting each type strictly on its own merits, it has become a fairly common practice to announce that each new type possesses these advantages associated with iron-powder electrodes. This unusual situation, coupled with a lack of adequate technical information concerning the performance characteristics and ad-

IRON-POWDER ELECTRODE DATA

A. W. S. Designation	E-6024 E-6027 E-6028	E-6014 E-6018	E-6010 + Iron E-6011 + Iron
Electrode Group	A	B	C
Approximate Weight of Core in %	50	68	87
Approximate Weight of Covering in %	50	32	13
Approximate Iron Content of Covering in %	50	32	15
Iron Available from Covering Expressed as % of Core	50	15.1	2.25

vantages of each type, has created repercussions that could do irreparable harm to the cause of the iron-powder electrode.

What advantages do we associate with iron-powder electrodes? The advantages that immediately come to mind are those of the E-6024 electrode with its ability to take high welding currents, give high deposition rate, operate with drag technique, and produce a self-removing slag. Thus to compare some of the later types of iron-powder electrodes with E-6024, if only by inference, amounts to making misleading claims.

It is this author's opinion that such a policy only serves to further alienate the interest of the skeptic of iron-powder electrodes rather than convince him of their merits. And there is a good chance that it would make skeptics out of those who had already been converted to their use.

Performance characteristics of the latest additions to the line of iron-powder electrodes are far removed from those with which the user has become most familiar. In fact, they so closely resemble their conventional counterparts that it may be difficult to recognize any advantages unless they are carefully pointed out. As a consequence, the adverse reaction to this situation among potential users is very real and has created the impression that iron-powder electrodes are experiencing an anti-climax. Such is not the case, but the fact

primary purpose of iron powder additions to electrode coatings is to improve arc action—not to increase deposition rate

remains that their advantages have not been explained in clear and understandable language.

A, B and C electrode groups referred to in tabular form are in the approximate chronological order of their introduction. Group C electrodes are currently undergoing evaluation tests by the welding industry. Also shown are approximate amount of iron powder available from the electrode covering to supplement the metal derived from the electrode core. It will be noted that the iron available from the covering progressively drops from 50 to 15.1 to 2.25% of the core for groups A, B and C respectively. While the iron available from the covering is not necessarily a true indication of the relative speed of the electrodes in the three groups, reduction of the iron powder content of the covering is accompanied by other modifications that also contribute to a general reduction of their deposition rate.

If there has been a progressive narrowing of the margin of the iron-powder electrode over its conventional counterpart with the introduction of each new type, what desirable performance characteristics do these electrodes possess that would justify their introduction? Remarks will be Confined to Group C electrodes since they represent the extreme from already well known Group A. Group B electrodes possess performance characteristics intermediate between Groups A and C.

It has been pointed out on numerous occasions that, concurrently with the use of heavy coverings of high iron powder content such as the E-6024 electrode, the characteristics of the arc were significantly altered. These alterations were characterized by a smooth, stable arc, better wash along the edges of fillet welds, reduction or elimination of undercut, and a lowering of spatter loss. These supplemental effects of the iron powder give the Group C electrodes the improved performance characteristics they possess over their conventional counterparts. Any speed advantage they may possess comes as an indirect result of the iron powder addition rather than as a direct advantage as in the case of the E-6024 electrode.

As a matter of interest, small additions of iron powder have long been used both here and abroad for the sole purpose of modifying the characteristics of the arc. In these cases, little attention was paid to the effect of the iron powder addition on speed and its use in electrode coverings was not publicized. With the advent of the E-6024 electrode and its subsequent wide acceptance, the use of iron powder in electrode coverings has almost reached the proportions of a fad and has been given wide publicity.

C Group electrodes are the conventional cellulosic variety to which approximately 15% iron powder has been incorporated in the covering. When conventional electrodes of the cellulosic variety

iron powder electrodes provide dual path for currents: reduce undercut, improve wash

are used at high welding currents, excessive premature decomposition of the cellulose in the covering impairs electrode operation before the normal usable length of the electrode is consumed. Furthermore, their spatter loss rises sharply as the welding current is increased above the optimum value. The addition of iron powder covering does not substantially change these inherent characteristics, but it does impart certain highly desirable features to their operation.

Conventional electrode coverings are essentially non-conductive in the region of the arc during welding. Practically the full welding current is carried from the end of the core, thence across the arc to the base metal producing a forceful and highly concentrated arc. This tends to undercut the base metal adjacent to the edges of the weld deposit, a condition particularly prevalent on fillet welds. The extent to which undercutting is experienced varies with the type of electrode employed, welding current, angle of electrode and many other factors.

If iron powder is added to the covering of conventional electrodes in sufficient quantity, it makes the covering conductive in the region of the arc during welding. In effect, it results in the formation of a secondary arc of low intensity between the covering and base metal in addition to the primary arc between the core and base metal. With the optimum addition of iron powder, it beneficially alters arc characteristics in several important respects. The amount of iron powder required to achieve the desired degree of arc alteration will vary with covering formulation and must be closely controlled to avoid an adverse affect on deposition rate of the electrode.

Conductivity of the covering due to the presence of iron powder reduces arc force and simultaneously increases the width of the arc flare on the base metal or work. These characteristics of the iron-powder electrode arc combine to reduce undercut and at the same time improve sidewall wash. The resultant weld is both flatter and more uniform in contour than those obtained with conventional electrodes of the same type.

Because the iron-powder electrode provides a dual path for the welding current across the arc gap, the arc is less affected by disturbances incidental to metal transfer. This is even more pronounced with alternating current than with direct current since metal transfer across the arc gap coincidental with cycle reversal quite frequently results in complete arc extinction with conventional electrodes. Thus, another beneficial effect of the iron powder addition is a smoother and more stable arc.

Metal transfer from electrode to base metal or work for Group C electrodes is of the globular variety. With this type of transfer, the arc gap between electrode and base metal is intermittently short circuited as the metal in transit momentarily bridges the gap. Just

continued on page 85

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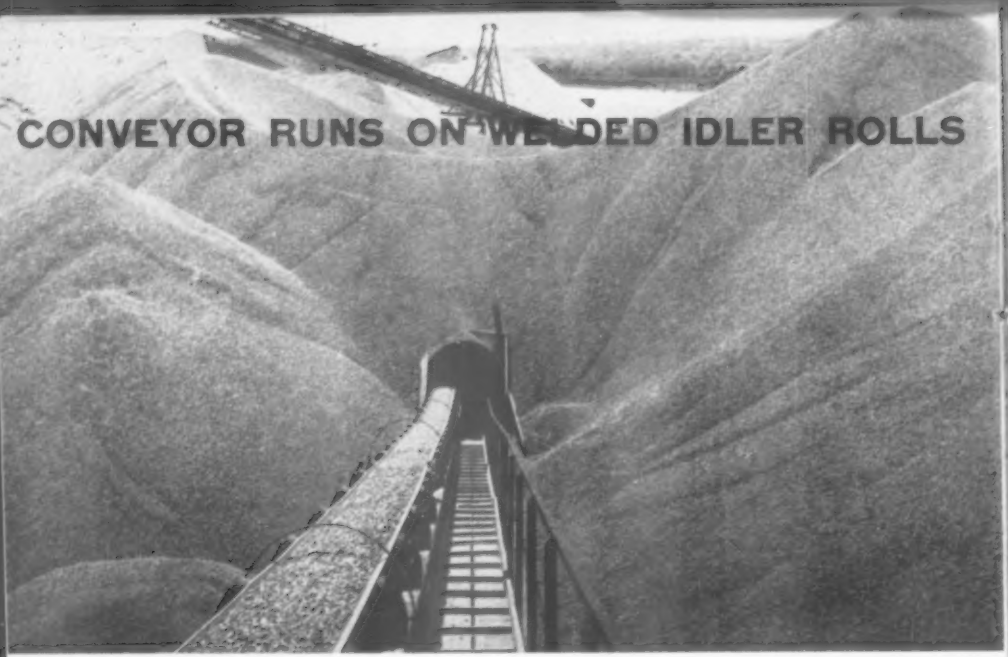
CONVEYOR RUNS ON WELDED IDLER ROLLS



At the Indianapolis plant of Link-Belt Company, a major source of materials handling and power transmitting machinery, years of experience and research have led company engineers to decide that the best way to make an idler roll is to weld it. How better, they concluded, to achieve concentricity and perfect alignment for smooth, minimum effort operation.

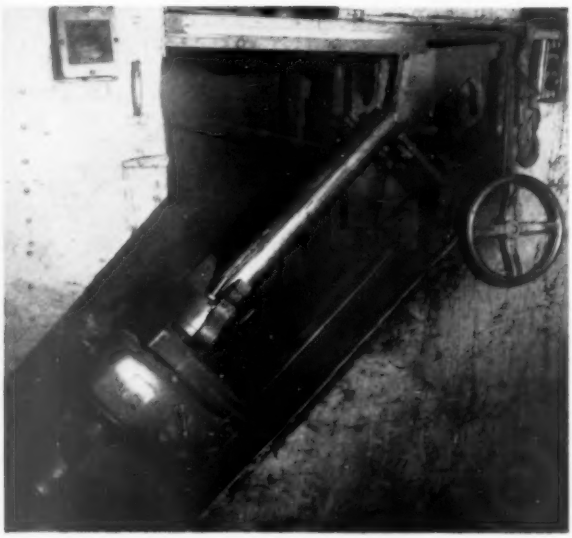
You see, the idler roll is the key to an efficient conveyor belt system. It is the basic unit that supports and assists the forward movement of long, continuous and unattended conveyor belts in the movement of bulk materials out of mines, through processing treatments and into other bulk carriers such as lake boats and hopper cars.

Mounted on a supporting frame and turning on ball or roller bearings in such a manner as to adequately support a moving conveyor belt, idler rolls must be of strong, durable construction and must require a minimum of maintenance. Important also, are retention of alignment, roll surface quality and free-running characteristics — all necessary to promote long life of expensive belting and to minimize horsepower requirements for operating the system.

The need for high production at reasonable cost suggested application of automatic welding. Two special automatic open-arc welding machines, feeding dust coated-type welding wire into weld joints, accomplished the purpose admirably. Each welder was equipped with dual heads for welding outer shell and central tube to end disc joints simultaneously. For rotating idler rolls under the arcs, power driven, air actuated chucks, adjustable to accommodate the complete range of roll sizes the company makes,

. . . fabricated on high production open-arc welding machines from tubing, shell and end discs

OPERATOR STEERS two arcs in making OD and ID welds on roll end. Spatter, typical of the open arc process, falls harmless on the end disc portion away from roller surfaces where it could be a problem.



SPECIAL welding machine positions, clamps and rotates press assembled idler rolls to make two welds on one end in approx. 30 seconds.

semi-bare wire welding is a prima donna operation, but spatter thrown is harmless

were provided. This range includes diameters from 4 to 6-inches and lengths from 4½ to 63-inches. To obtain optimum weld penetration and contour, chucks were fixed at approximately 40° from vertical on a length-adjustment slide which also contained a support for the free end of the roll. Chuck rotation was also made variable to provide the correct welding speed for various idler roll diameters.

Basically, idler roll design consists of a tube and a shell joined by continuous welds to formed steel end discs. These elements are all of SAE 1010 steel — a material ideally suited for welding. Shells and central tubes are lathe cut lengths of seamless tubing having wall thicknesses ranging from 8 to 9 Ga., depending on roll size. End discs are generally 8 Ga. stock.

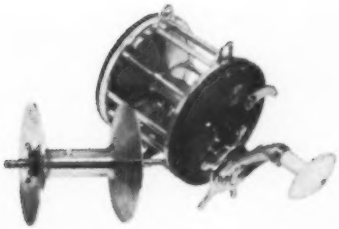
Assembling idler roll elements in preparation for welding is a high production operation. It consists first of pressing outer bearing races in each end of the counterbored central tube in one operation; then pressing end discs, central tube and outer shell into one ready-to-weld assembly, on the same machine. Correct location of parts is accomplished with the provision of shoulders machined in shell and central tube ID and OD respectively.

The full load-weld-unload cycle for completing one end is approximately 30 seconds. After dropping the press assembled roll into the open chuck jaws and support, the operator closes a protective cover complete with dark viewing lens. Actuating the clamping chuck also positions the welding heads at the correct distance from each weld joint, by means of an air cylinder. Welding currents used for shell-end disc welds are 275 amps, 22 to 25 volts at a travel speed of 32 to 3 ipm; central tube-end disc welds are made at 175 amps, 17 to 20 volts. Welding wire, $\frac{5}{32}$-inch and ⅛-inch diameter, is used for ID and OD welds respectively.

While welding with semi-bare wire is no prima donna operation from the standpoint of spatter ejection; this characteristic is more an annoyance than it is harmful. The spatter falls harmlessly on the end disc portion, away from roller surfaces where it could be a problem.

During welding, the operator controls only the centering of the arcs in each joint. This is done by means of two conveniently located steering controls, which provide limited lateral control of both welding heads during the complete cycle. Making welds on the opposite end of the idler roll is a repeat of the above process.

Following welding, roller bearings and combination seals are pressed into each end of counterbored central tube. Effective seals are important since they keep lubricant in, while preventing dirt entry in this vital area. Final assembly consists of inserting through-shafts, bored to deliver lubricant to the central reservoir-bearing area, running-on grooved hexagonal positive locking nuts, and installing a grease fitting at one end. Assembling completed rolls into special frames, in the correct number and combination to gain the desired flat-belt or troughed-belt contour, prepares another unit for long, dependable service in material movement.



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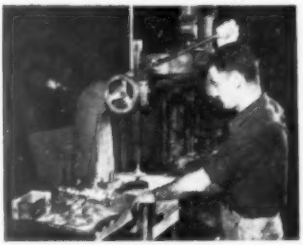
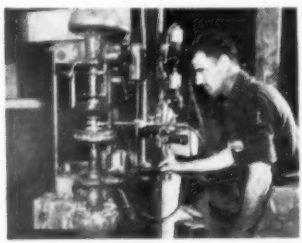


Inserting fluxed spindle and EASY-FLO silver alloy ring into lower half of spool. Assembly is completed when upper half of spool is pressed onto spindle. Press fit is necessary to maintain proper joint clearance between brass spool and steel spindle at brazing temperature.



Sliding burner assembly into heating position. Weight of upper platen assures accurate joint fit when ring of EASY-FLO alloy melts. Fuel is mixture of city gas and oxygen. Operator brazes 20 to 30 spools per hour.

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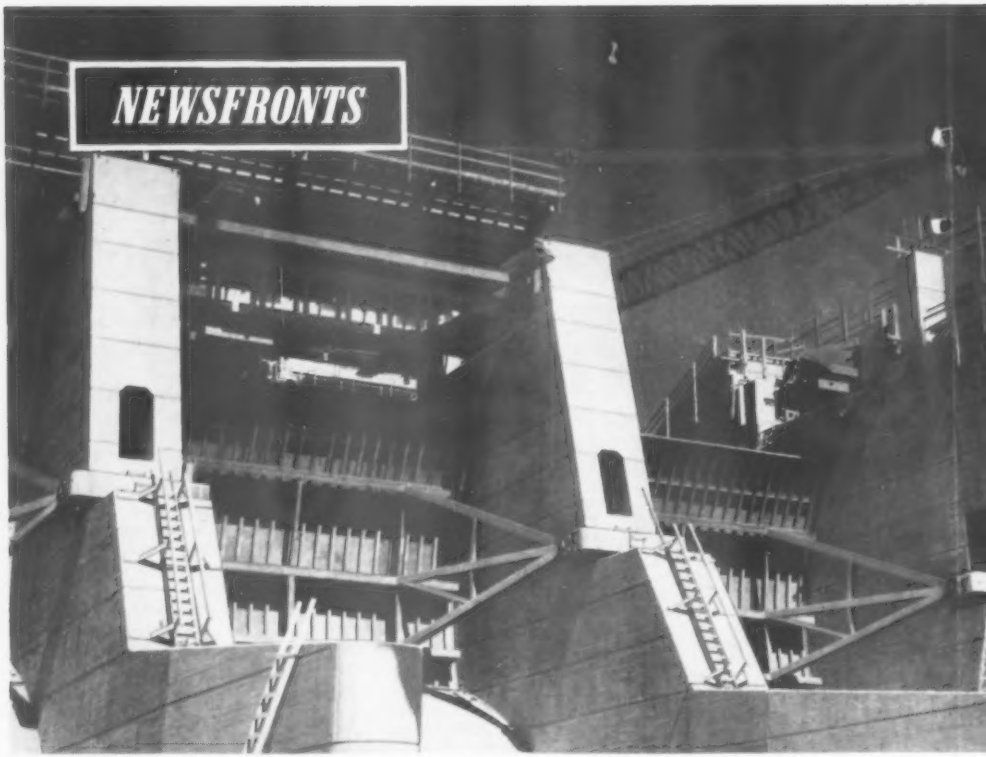

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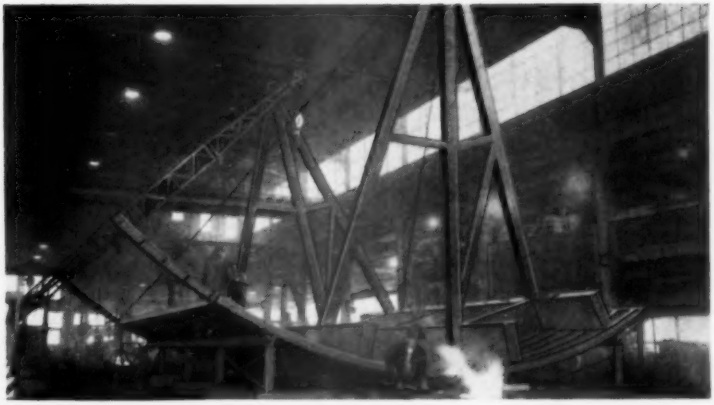

UPPER LEFT — Downstream view of two of the 21 tainter gates in the Fort Randall spillway. TOP RIGHT — View in Omaha Steel Works shops shows tainter gate assembly nearing completion. LOWER RIGHT — Overall view of partially completed dam.

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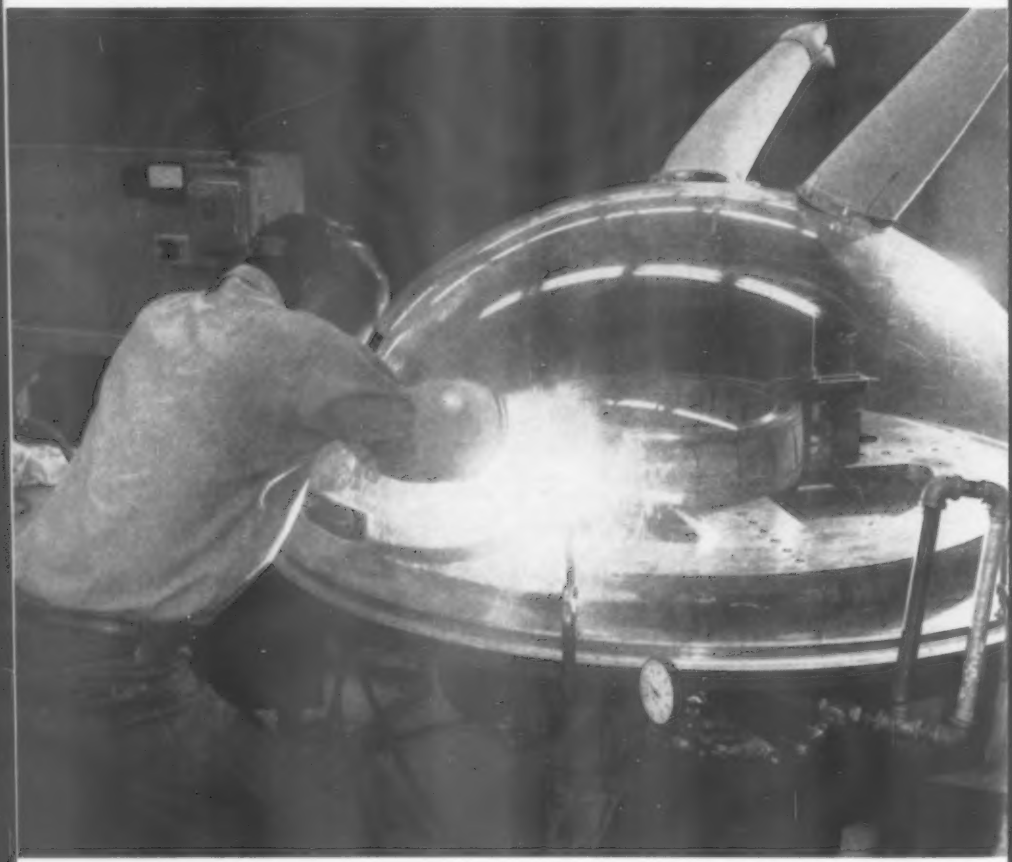
SOLAR WELDS ELECTRONICALLY

by **GORDON PARKS**, *welding engineer, Solar Aircraft Company*



PLASTIC CHAMBER used in welding titanium contains argon gas shield that protects molten weld metal from nitrogen, hydrogen or oxygen which could cause brittle welds. Operator here is making a seam weld in inlet guide for Pratt & Whitney J57 engine.

FOUR REVOLVING JIGS that are electronically controlled are positioned around "MIG" welder. Power-swung radial arm moves welding head into position at each.

WELDING is entering a new era at Solar Aircraft Company in Des Moines. Modern equipment and new techniques are being used by this company, where 95 per cent of production involves welded fabrication. Although not confined to the aircraft industry, the greatest advances in welding have been in the aircraft powerplant field to build turbojet and turboprop engines that are replacing the reciprocating engine in military aircraft. Composed mainly of sheet metal, these new engines require 90 per cent more welding than the old cast, forged and machined piston-type engines and set new standards for efficiency, performance and configurations.

To the designer, the change means a saving in weight, greater strength and endurance and improved efficiency. To the engineer, it means greater precision, increased quality controls and the introduction of new problems associated with the use of new metals and alloys.

To achieve greater precision than is possible with manual welding, Solar has installed three new electronically controlled welding machines. Once a schedule has been established and programmed by electronic controls, these machines will complete an operation with the flip of a switch.

Called "TIG" by Solar, the first machine is an inert gas tungsten arc unit used to weld jet engine inlet guides. Nearly 10 feet tall, it includes a radial welding arm that can be swung around for use on two or more fixtures, control boxes for both arm and fixtures and a main power source.

Used mainly for continuous-line welding, unit has two revolving jigs. Part to be welded is placed in one of the jigs and welding head is indexed. Tungsten arc then strikes and the welding cycle begins. Electronic controls feed and regulate filler wire as it moves into arc. The controls also start the circulation of cooling water through the torch, begin the flow of argon that protects the weld from harmful elements in the air and links in the revolving action of the jig. Electronic motors relieve the operator of lifting and moving problems. With the push of a button, he can lower or raise the boom, swing it left or right, jog it into

this Solar idea,
a single equipment package,
can improve any
welding setup

50 EFFICIENT WELDING STATIONS have controls, table, light and torches.

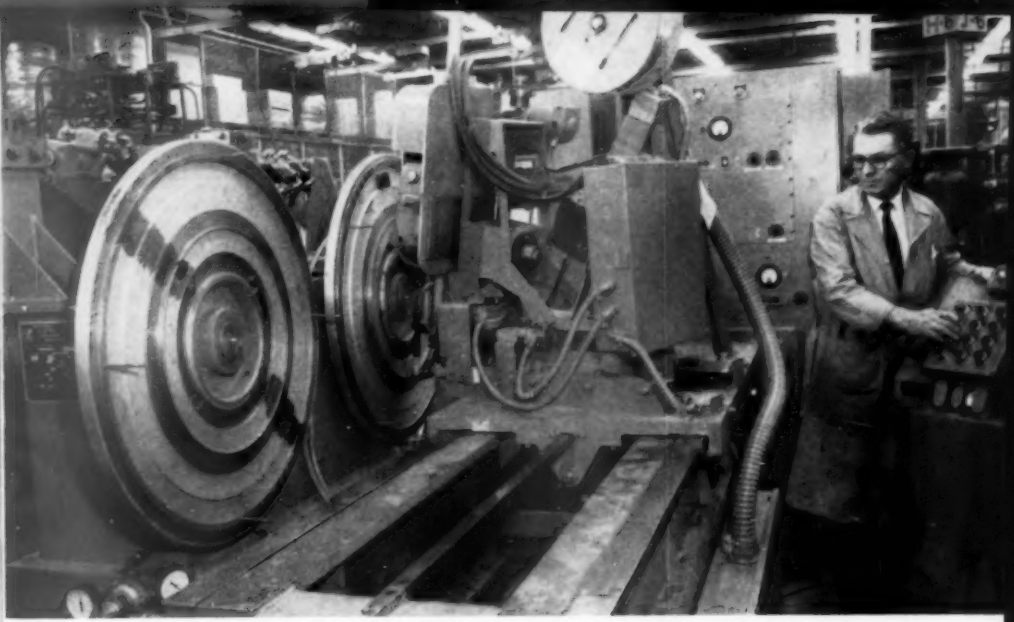
alignment with a weld joint or activate the movable jig.

The second machine, called "MIG," operates similarly but uses a consumable electrode instead of a permanent-type tungsten torch point. A metal wire fed through the torch carries the electric current and strikes the arc, and the heat created melts the wire to form the filler material. Controls feed the wire at the same rate that it is consumed in the welding process. With electronic controls similar to the TIG, this machine is used in the production of jet engine diffusers and employs four electronically controlled revolving jigs.

"Tiggle Wiggle" is Solar's nickname for the third machine, used to weld vanes to inner shrouds in J57 vane and shroud assemblies. Weldments are placed on revolving plates, operator moves the tungsten arc into position and the cycle begins. As arc and filler move across the vanes, they wiggle back and forth in producing the weld and giving the machine its name.

Also new at Solar are a series of company-designed welding stations that consolidate manual welding equipment into a single package. Formerly, operators had little or no control over water and power supply. Gas was piped to the work from cylinders or a central system, and moving welding locations was not easy.

However, the new welding stations have changed the whole complexion of the job. A single cabinet now houses all controls and also supplies the facilities for each welding station. Gauges on the control panel provide instant information on gas pressure and electrical power. With the flip of a



"TIGGLE WIGGLE" electronically controlled welding machine gets its name from wiggling action of tungsten arc during welding of units mounted on vertical plates.

switch, the operator can either set his station into constant operation or use a remote control foot rheostat switch.

These single-unit stations simplify and expedite changes in location, result in cleaner working areas, promote a better quality of work and conserve power and gas. Automatic shut-offs, for example, stop the flow of argon 30 seconds after the arc has been broken.

In an effort to increase aircraft strength-to-weight ratios, increasing emphasis has been placed on use of titanium and aluminum. Although these metals and their alloys have aided the designer, they have created many new problems for the welding engineer.

Titanium, for example, has an affinity in the molten state for certain elements in the atmosphere; welded in open air, it absorbs nitrogen, hydrogen and oxygen to produce a porous and brittle weld.

To overcome this deficiency, Solar engineers have developed means of fabricating titanium in an inert atmosphere. Solar uses plastic and steel purge chambers ranging in size from a plastic bubble two feet in diameter to a square steel chamber seven feet wide. After titanium parts are placed in the chamber, the air is pumped out and argon is introduced, forming an inert atmosphere. Slipping his hands inside the chamber, the operator sees the part either through the plastic or a glass window and is able to produce a flawless weld.

On the other hand, aluminum presents a different problem. It passes rapidly from a solid to a liquid state, with little time spent in the soft state most desirable for

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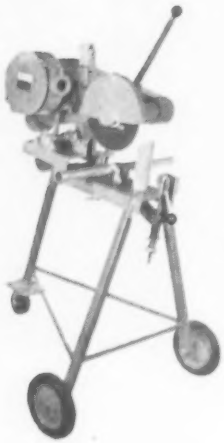
LOOM Etc.



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welding. If welded with the same equipment and heat periods used on stainless steel, for example, it will melt and run. It must be welded quickly with a greater electrical force and increased pressure. Two new spotwelders were designed especially for aluminum welding and are now being used to produce vanes and shrouds. Two large transformers are located over the machines so that the power required will not affect other welding equipment in the plant; they step the voltage down from 1,300 to 440 volts and insure a large power reserve.

Requirements for precision have carried welding far beyond the handyman-type of operation. The operator of tomorrow will use new tools and electronic equipment to give him better control and accuracy.

ALUMINUM BODY

continued from page 53

the interim period on the contacting surfaces of the first two pieces, would not be a factor in making the spots joining all three panels.

It is realized, however, that a production method of cleaning, less time consuming and more practical than wire brushing, must be found. Solution cleaning of all the pieces and sub-assemblies immediately prior to welding appears to be the only certain method at this time.

Probably the second most important factor in successful spot welding of an aluminum body is the need to locate the proposed spot welds in accessible positions. This is most important because as compared to steel, aluminum spot welding requires larger electrodes to carry the increased current, and

because the tip pressures are higher, severely offset tips for inaccessible welds are not likely to carry the load.

After the body assembly was completed it was placed in the paint ovens where it was subjected to a low temperature heating cycle. The heat treatment was to bring the aluminum to the T-6 state and the required yield strength.

After completion of heat treatment the structures test was initiated.

ARCRODS NAMES PREVAS

Peter J. Prevas has been named to the post of assistant plant superintendent of Arcrods Corporation, Sparrows Point, Maryland.

BLANC TOURS U.S.

Dr. Gregory Blanc, Director of Research for Eutectic Welding Alloys Corporation's European affiliate, Societe des Soudures Castolin, Lausanne, Switzerland, reported on Europe's metallurgical progress during an April lecture tour at MIT, Case Institute, University of Michigan. Dr. Blanc led welding conferences at Battelle Institute and with the engineering staffs of such organizations as Ford Motor Company, General Electric and Sorel Industries in Sorel, Canada.

Dr. Blanc holds a doctorate in electrical engineering from the Swiss Polytechnic Institute (E.T.-H.) Zurich. He is head of the Brazing Committee of the International Welding Institute.

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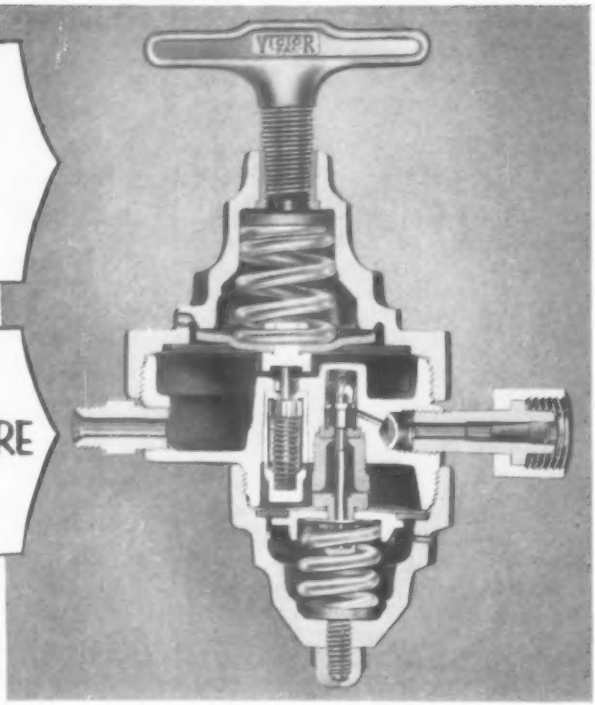

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Classification of Hard Surfacing Materials Prior to 1950	
GROUP	DESCRIPTION
1.	Iron base material with less than 20% alloy content
2.	Iron base material with more than 20% alloy content
3.	Non ferrous alloys
4.	Carbides

this simple list represented the first step towards ending confusion by

STANDARDIZING SURFACING MATERIALS

latest proposed standards identify a major segment of surfacing alloys by naming main constituents

by W. L. LUTES and H. F. REID, Jr.*

WEAR and the damaging effects of wear annually cost industry literally billions of dollars in repair and replacement of equipment and in lost production capacity. There is a wide variance in the amount of metal that safely can be lost, through wear, without impairing operation of industrial equipment. In general, the more precise the equipment the smaller the permissible amount of wear loss that can be tolerated. For example, a hundred or more pounds of metal might be worn from the teeth of a large power shovel before replacement or repair of the teeth was necessary. On the other hand, only five pounds of lost metal have been reported to be the difference between a brand new truck and one ready for the scrap heap.(1) In still other aplications the wear loss that can be tolerated is measured in ounces or even in grams.

The annual industrial cost of wear would reach even higher proportions if surfacing materials and techniques had not been developed and utilized. To many, surfacing or the more commonly used term "hard surfacing" describes any means of hardening the surface of metals. According to this interpretation, hard surfacing includes case-hardening, flame-hardening, metal spraying, nitriding, hot-dip coatings and overlays of weld metal deposited by arc- or gas-welding techniques. For this particular discussion, surfacing materials will be limited to those applied by welding with emphasis on the coated electrode.

Despite the increased use of wear-resistant material by manufacturers of original equipment and field maintenance men alike, the general field of surfacing materials has

here's real progress: a suggested classification for ferrous materials . . .

COMPARISON OF FILLER METAL DESIGNATIONS

Description of Alloy	1950 Nomenclature	Possible Designation Conforming to Pattern of 1956 Specification
A. Hardenable Alloys	I-A	Fe
1 Carbon Steels	I-A-1	Fe 1
a Low carbon	I-A-1a	Fe 1a
b Medium carbon	I-A-1b	Fe 1b
c High carbon	I-A-1c	Fe 1c
2 Low-Alloy Steels	I-A-2	Fe 2
a Low carbon	I-A-2a	Fe 2a
b Medium carbon	I-A-2b	Fe 2b
c High carbon	I-A-2c	Fe 2c
d Cast-iron types	I-A-2d	Fe 2d
3 Medium Alloy Steels	I-A-3	Fe 3
a Medium carbon	I-A-3a	Fe 3a
b High carbon	I-A-3b	Fe 3b
c Cast-iron types	I-A-3c	Fe 3c
4 Medium-High Alloy	I-A-4	Fe 4
a Low carbon	I-A-4a	Fe 4a
b Medium carbon	I-A-4b	Fe 4b
c High carbon	I-A-4c	Fe 4c
d Cast-iron types	I-A-4d	Fe 4d
5 High-Speed Steel	I-A-5	Fe 5
B. Austenitic Steels	I-B	.....
1 Chromium and Cr Ni	I-B-1	.....
2 High manganese	I-B-2	Fe Mn
C. Austenitic—not usually heat treated	I-C	.....
1 High Chromium iron	I-C-1	Fe Cr

and for non-ferrous, as well

COMPARISON OF FILLER METAL DESIGNATIONS

Description of Alloy	1950 Nomenclature	Possible Designation Conforming to Pattern of 1956 Specification
Cobalt Base Alloys		
A. Low alloy	II-A	CoCr-A
B. High alloy	II-B	CoCr-C
Carbides		
A. Inserts	III-A	WC-A
B. Composite	III-B	WC-B
C. Powder	III-C	WC-C
Copper Base		
A. Copper-Zinc	IV-A	CuZn
B. Copper-Silicon	IV-B	CuSi
C. Copper-Aluminum	IV-C	CuAl
Nickel Base		
A. Nickel-Copper	V-A	NiCu
B. Nickel-Chromium (Nichrome)	V-B	NiCr
C. Nickel-Chromium-Tungsten-Molybdenum (Hastelloy)	V-C	.....

specifications still must be drafted for a wide range of low-alloy and moderately alloyed ferrous materials

been and continues to be one of the most confused areas of welding technology. Such confusion frequently has resulted from a lack of appreciation of the complexity of most industrial wear problems, a lack of basic information on the engineering properties of the materials being applied, or from the over-zealous claims on the part of the material supplier.

Increased use of surfacing materials has produced, from many quarters, a demand for better engineering data on the properties of alloys recommended for surfacing applications. The inadequacy of electrode comparison charts emphasized the need for some system of standardization and comparison of the products produced by the more than sixty companies competing for the market.

Standardization — Before 1950. Hard surfacing of metals first was proposed in a patent by J. W. Spencer in 1896. The commercial possibilities and potentialities of this new approach were not put to use for about twenty-five years. In 1922, the use of a hard surfacing alloy was introduced into the oil fields to improve the service life and cutting ability of rotary drills. Success in this initial venture prompted investigators to develop and use other alloy combinations for severe service applications. Within a relatively few years, heavy industries such as mining, excavating, road-building and steel-producing were investigating and in many cases using surfacing materials. Early in the 1930s, the development and successful use of alloys to rebuild worn railroad crossings opened another wide field for tonnage requirements. By 1950, several hundred hard surfacing materials and proprietary alloys were available under a variety of trade names.

Initially, practically all surfacing was done using oxyacetylene welding techniques. As the use of surfacing materials increased, coated arc welding electrodes were introduced to meet industrial needs for specialized alloys and increased deposition rates.

Despite this rapid growth, little thought was given by most users and producers to standardization of the alloy combinations. The primitive classification system in use in literature of that time dealt in broad groups which needless to say, were of little assistance to either the prospective user seeking to select the best alloy for his specific application or to the manufacturer seeking to classify his products.

This ultra-simplified grouping was modified only slightly and included as the latest authoritative information on surfacing materials in the most recent edition of Metals Handbook[2]. One of the first books devoted exclusively to a discussion of surfacing materials and methods utilized this broad classification system[3].

On the surface it appeared that there was little or no interest in the development of industry-wide standards. Yet there were those in industry who felt that the ultimate success and acceptance of hard surfacing materials demanded a more

American Welding Society has spearheaded the drive for industry-wide surfacing material standards

basic scientific approach than appeared possible in the absence of fundamental information on the materials and their properties. About 1943, the Subcommittee on Surfacing Filler Metals was organized under the joint sponsorship of the American Society for Testing Materials and the American Welding Society. As one of the active members of this committee, H. S. Avery suggested classification of surfacing materials based on metallurgical structure of the weld deposit(4). This basic concept and modifications of it gained increased acceptance among leaders in the welding field.

During the latter years of this period, a concentrated effort was made to assemble information on the properties of materials being sold as surfacing materials. This work, spearheaded by the American Welding Society, laid the foundation for the first major step toward development of industry-wide standards.

Standardization — 1950 to 1955. The Third Edition of Welding Handbook gave voice to the demands for some degree of standardization of surfacing materials. It proposed a classification system based on chemical composition of the weld deposit(5). This system was presented as a guide to assist in the selection of surfacing materials, but acceptance and use of the system was very limited and it was not incorporated into any of the normal regulatory specifications. Toward the end of this period, some government electrode specifications patterned after portions of the system were proposed. Electrode manufacturers showed little interest in developing alloys to meet individual group requirements or in modifying existing alloys to bring them within the proposed chemical limitations. For the most part, the classification system remained buried and passed unnoticed in the ever-increasing flow of welding literature.

Fortunately, leaders in the surfacing field recognized the limitations of the proposed classification system. Work was started again to study ways to make the classification system more specific, more usable and ultimately more acceptable to both the user and the manufacturer.

Standardization — Today and Tomorrow. 1956 marked a major milestone in the slow but steady progress toward standardization of surfacing materials. For the first time, a major segment of surfacing materials was defined in a joint ASTM-AWS specification(6). This initial specification defined compositional limits for a number of highly alloyed ferrous alloys and a wide range of non-ferrous materials.

This specification introduced a new, simplified nomenclature to assist in identifying the prime constituent or constituents of the surfacing alloy. The system was explained in the Appendix to the specification as follows:

"The letter E at the beginning of each classification indicates an electrode, and the letter R indicates a welding rod. The letters immediately after E or R are the chemical symbols for the principal elements in the classification. Thus, CoCr is a cobalt-chromium alloy, CuZn is a copper-zinc alloy, etc. Where more than one classification is included in a basic group, the individual classifications in the group are identified by letters A, B, C, etc., as in ECuZn—A. Further subdivision is done by using a 1, 2, etc., after the last letter, as the 2 in ECuA1—A2." (7)

Possible correlations between this new nomenclature and the 1950 version are shown in tables covering ferrous and non-ferrous materials.

Only a few months have passed since release of this first formal AWS-ASTM specification for surfacing materials. It is too early to appraise ultimate acceptance by industry. To encourage acceptance, many manufacturers of surfacing electrodes have adopted the new classification system and are incorporating specific grade information in educational and promotional literature. Comparison charts based on these new groupings are appearing.

All concerned with this problem of standardization hope that it will only be a matter of time until the welding supervisor or engineer refers to an EFeMn-A electrode with the same ease and familiarity now employed when referring to a cellulose-base E6010 electrode. An aggressive, intensive educational program will be necessary to accomplish this end in the shortest possible time.

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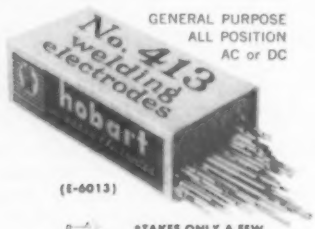

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Industry-wide acceptance and use of this first specification for surfacing materials will not solve all the problems associated with product standardization. Specifications still must be drafted for the wide range of low-alloy and moderately-alloyed ferrous materials covered by the proposed EFe1 to EFe4 groupings. Work to this end has been in progress for some time. Many complex problems must be overcome before a workable specification is possible. Perhaps the most basic problem is the establishment of electrode groupings wide enough to cover the variety of specialized alloys now being produced and yet simple and specific enough to have meaning for comparison purposes. The answer to this problem holds the key of future successful standardization of ferrous surfacing materials.

The increased use of tubular surfacing wires and of highly-alloyed granular welding fluxes pose new problems for future standardization.

*Mr. Lutes and Mr. Reid are managers of the Hard Surfacing and Technical Service Departments, respectively, of The McKay Company.

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(4) Howard S. Avery, "Hard Surfacing by Fusion Welding," Monograph on Wear No. 1, American Brake Shoe Company, 1947, p. 32.

(5) *Welding Handbook*, Third Edition, 1950 p. 472, p. 869.

(6) "Tentative Specification for Surfacing Welding Rods and Electrodes," ASTM Designation: A399-56T, AWS Designation: A5.13-56T.

(7) Ibid., p. 11.

IT'S THE *MOST

ANNOUNCING

the Sensational *NEW* miller GOLD STAR SR

It ***DELIVERS*** maximum arc stability for:

a. Sounder, denser welds – and more of them – in less time, with . . .

b. ALL electrodes, in . . .

c. Any and all positions

How is this performance possible? THE MILLER GOLD STAR SR introduces a . . .

NEW transformer

plus

NEW weld stabilized current

plus

NEW completely sealed semi-metallic rectifier

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Tested across the country by practical, critical, hard-bitten working weldors, here's what they say about the new Miller GOLD STAR SR:

"it's the DC performance I've always wanted"
"here's DC welding current that's . . . perfect!"
"positively handles ALL electrodes better"
"best deal I've seen for v and o work"
"easiet arc starting in my experience"
"smoothest arc I ever used . . . and . . . quiet!"
* "it's just plain the MOST"

Complete particulars on the MILLER GOLD STAR SR, including inert gas and automatic fixture welding, is now available on request.

miller ELECTRIC MANUFACTURING CO., INC. APPLETON, WISCONSIN

distributed in Canada by CANADIAN LIQUID AIR CO., LTD. Montreal

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In October '54, the welding habits of America were changed by the introduction of Atom • Arc, the first all position iron powder low hydrogen electrodes. Now, equally important changes are taking place with the NEW . . .

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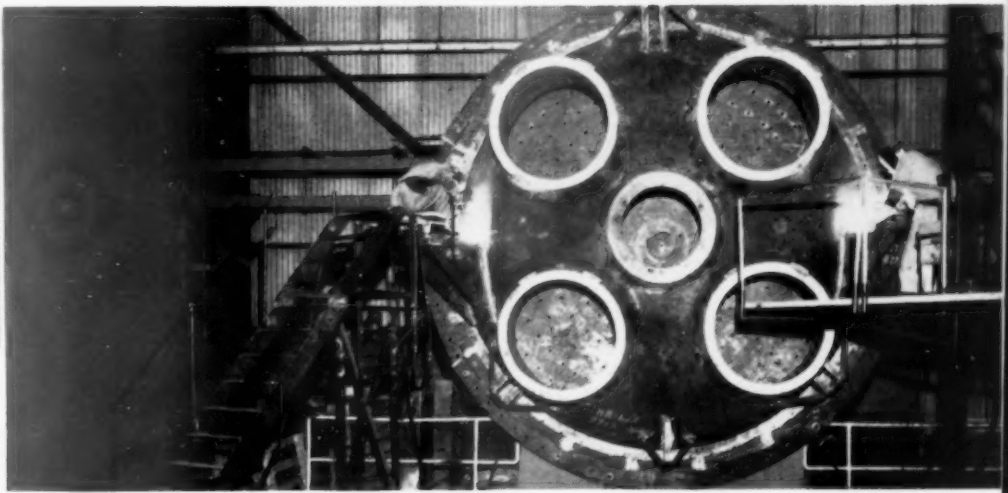
ATOM•ARC DH-12

IRON POWDER LOW HYDROGEN ELECTRODES FOR DOWN HAND WELDING



NEW ATOM•ARC DH Electrodes deposit up to 12 pounds of weld metal per hour with X-ray quality and physical properties equal to class E-7016 electrodes.

Just imagine, the visibility and flexibility of metallic arc welding with welding speeds and deposition rates comparable to semi-automatic submerged arc welding . . . and without messy fluxes or cumbersome equipment to handle. These advantages are yours with these *new* electrodes.

ATOM • ARC DH-9 FOR DOWN HAND WELDING AND HORIZONTAL FILLETS deposits X-ray quality weld metal at the rate of 9 pounds per hour at 300 amps. Burn off rate is 12.4 inches per minute.

ATOM • ARC DH-12 FOR DOWN HAND WELDING deposits X-ray quality weld metal at the rate of 12 pounds per hour at 360 amps. Burn off rate is 11.9 inches per minute.

. . . . . **Mail coupon today for complete facts** ►

Please send me the facts on Atom • Arc DH Electrodes

ALLOY RODS COMPANY
P. O. Box 1828, York, Pennsylvania

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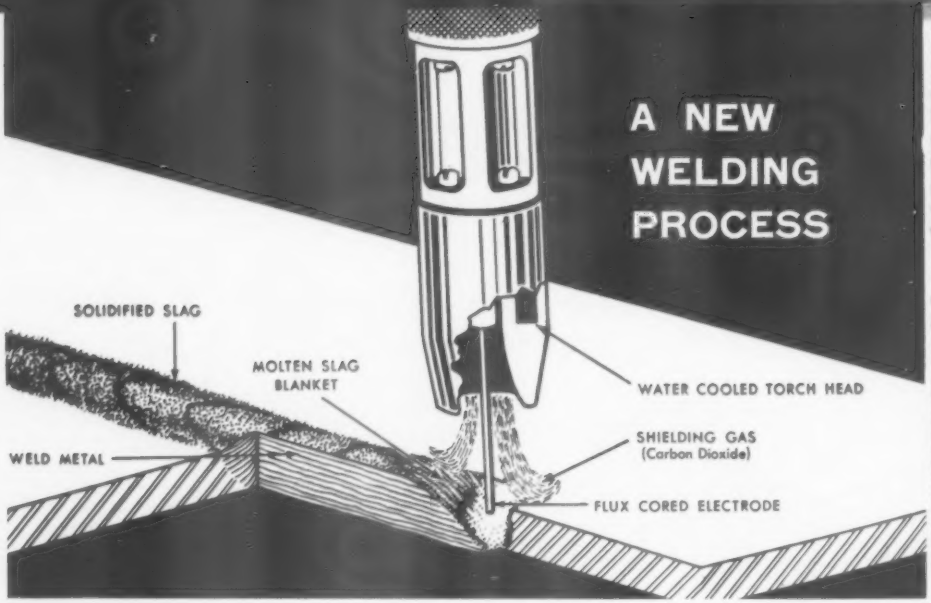
Alloy Rods Co.

NO FINER ELECTRODES MADE . . ANYWHERE

A NEW WELDING PROCESS



this process could be the key to visible . . . high speed . . . deep penetrating, semi-automatic welding.

A PROCESS described as a new development in arc welding and said to produce faster and better welding at lower cost has been developed by National Cylinder Gas Company.

Norman S. Strandwitz, head of welding apparatus and electrode sales, said the process — called 'Dual Shield'—"deposits weld metal three to twelve times faster than manual electrode welding and a conservative 33 per cent faster than established semi-automatic methods."

Process introduces a flux-core electrode in economical and effective combination with shielding carbon dioxide gas. It is said to give the metal working industry sound low-cost welding of any type of mild steel, including cantankerous rim and T-1 steels, at a high rate of weld metal deposit and travel speed and with unusually deep penetration.

NCG, company officials said, has spent more than ten years in developing and testing the Dual-Shield process, and is now making it available in production quantities.

An operator using the new method can see exactly where he is welding because for the first time the granular flux additives that protect the work from atmospheric impurities are "built in" as the core of the special welding electrode. This chemical flux includes an ionizer to stabilize the electric arc; a deoxidizer that permits welding mill-run steel with-

SPECIAL REPORT

KEYS to new semi-automatic welding process are flux additives and CO_2 gas shielding These promote stable arc and weld metal protected from atmospheric impurities—even in mill-run, rim and T-1 steels.

out cleaning it first, and a slag-forming agent. The new process employs inexpensive carbon dioxide gas in a dual role—to exclude contaminating air from the arc and molten metal and to introduce a measured portion of oxygen directly into the weld pool where it combines chemically with certain of the flux additives to clean and purify the metal being welded.

What results is a stable arc at least 1000 degrees hotter than the average 9000-degree welding arc. A single pass with the welding gun is claimed capable of welding the full thickness of a half-inch steel plate. Welds are said to be stronger because depth of penetration is 40 per cent greater than can be achieved by manual stick electrode welding, and X-ray tests reveal that Dual Shield welds are of high purity, dense and free of porosity.

Field tests with the new process indicate that substantial operating savings are possible over the manual method in time and cost per pound of weld metal deposited. A Chicago shop that field-tested the new process now allots six minutes to a Dual Shield welding job that formerly took 46 minutes for a manual stick electrode weldor to perform. A Texas firm making cylinders and transport trucks found Dual Shield capable of welding tough T-1 steel that had been suffering many rejects after welding by the submerged arc process. In Florida a manufacturer of oil tanks discovered that a circumference welding job requiring 35 minutes with stick electrodes could be done by a Dual Shield semi-automatic operator in less than half the time, including time to set up and tear down the job.

Initial investment in the new process—including welding gun, electronic control unit, welding transformer, spool electrode and gas supply, plus the cost of training an operator—is said to be less than the cost of equipping and training

DESIGN FOR PROFITS— WITH EUTECTIC

A Chicago steel furniture manufacturer was able to simplify design and reduce costs of his entire contemporary steel furniture line because of high strength EutecRod 16.

Engineers found that with thin flowing "brazing type" EutecRod 16, cross bracing between legs was unnecessary and difficult angle joints were possible. This saved steel, saved production time and made a more attractive product in keeping with today's stark, functional styling. Higher strength also permitted use of thinner steel tubing.

Completely fabricated with EutecRod 16; Suspended arm, joined at only one point with EutecRod 16, was impossible with conventional materials.

WAREHOUSE-SERVICE CENTERS

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three manual operators for the same amount of work.

In training operators, the new process provides savings in time and cost. In one day a novice can be taught to do welding of quality equal to that performed by a man who has been instructed for a month in manual welding; in fact, an average man can do an acceptable semi-automatic welding job after a few minutes of over-the-shoulder observation, a brief explanation and a few practice passes with the hand-held gun.

The demonstration showed that Dual Shield deposits more than 99 per cent of its weld metal in the weld, virtually eliminating spatter. The new process automatically cleans scaly, oily, rusty steel as it is welded and the slag shield "pops" up as it cools. Preparation of steel for ordinary arc welding can be costly and time consuming, involving extensive cleaning before, and use of a hammer to chip the slag off after the welding is finished.

Not only can the operator weld faster because he can see where he is welding, but he can work more steadily and efficiently for longer periods because of the comfort of the balanced 1½-pound gun through which the flux-core electrode is automatically and continuously fed at just the right length and rate of speed for the job at hand.

The new electrode will cost about ten cents per pound more than conventional spool electrodes for submerged arc welding. But company spokesmen point out that Dual Shield makes up the difference with savings in time, labor, shop space, cost of additional flux, use of inexpensive carbon dioxide and virtual elimination of rejects.

IRON POWDER ELECTRODES

continued from page 58

prior to reestablishment of the arc following short circuit the drop necks down, at which time a current density of tremendous magnitude develops at this point. With conventional electrodes, this phase of metal transfer is accompanied by a violent explosive force that throws out considerable metal in the form of spatter.

And once again, the dual arc path of the iron-powder electrode performs a beneficial function. Because part of the welding current is carried by the covering, the intensity of the explosive force at the moment of necking down is sufficiently reduced to noticeably lessen spatter loss.

NEXT MONTH . . .

a manufacturer of iron powder electrodes tells just how successful these new electrodes have been.

METAL & THERMIT NAMES THREE

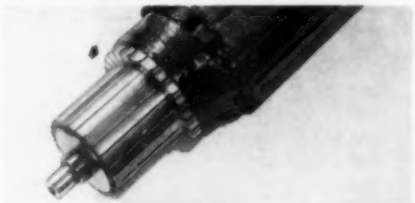
R. T. Bown, sales manager of Metal & Thermit Corporation's Welding Division, has announced the following changes in organization.

N. F. Kiernan assumes the post of regional manager for welding products in the West Central Region with headquarters at the company's sales office in East Chicago, Indiana.

J. DeSanto, who has served as acting regional manager at East Chicago for the past two years is undertaking additional field sales responsibilities in the Chicago area.

C. F. Delbridge succeeds Mr. Kiernan as regional manager in the Northeastern area and will have offices at Rahway, N.J.

EUTECROD 155 WITHSTANDS HEAT . ...HOLDS AT HIGH SPEEDS...



A manufacturer of concrete vibrating machines wanted to perfect a vibrator motor which would not require a thermo-protection switch to protect the armature. The armature, which cannot be ventilated, has a temperature rise of approximately 220°F. Conventional solders failed when this temperature was reached.

Using EutecRod 155 and its companion Eutector Flux 155, a solder-type alloy, high strength soldered connections were achieved.

EutecRod 155 soldered connections withstood tests up to 17,000 rpm, at peak temperatures.

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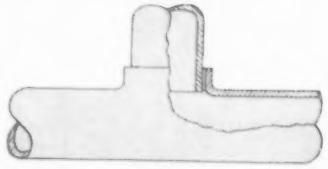
WELDING ROD CLINIC

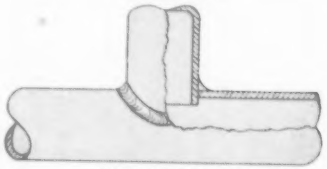
J. Imperati and R. F. Pulver, Welding Engineers
The American Brass Company, Waterbury, Conn.

Steel products are quickly, economically assembled by Braze Welding

Velocipede frame of 2" mild steel tube braze welded with 1/8" Anaconda-997 (Low Fuming) Bronze Welding Rod. The quickest, most dependable and economical method of joining steel tubing says manufacturer, The Frank F. Taylor Co.



BRAZED LAP JOINT



BRAZE-WELDED JOINT

Circle No. 7 on Reader Service Card.

Many articles of steel in widespread use are, or can be, economically assembled by oxyacetylene braze welding. Typical of one group are items made of round and square tubing, such as school and office chairs, equipment handles, and frames for bicycles and wheeled toys, portable generator sets, and motor scooters. Another group uses sheet metal, formed moldings, rods, castings, and forgings to make cabinets and enclosures for sinks, refrigerators, files, etc., office furniture, wrought-iron furniture and decorative items, storm sash and screen frames, auto-body parts, and others.

Advantages. The advantages of braze welding are fully realized by the use of Anaconda-997 (Low Fuming) Bronze, Tobin Bronze-481 and Nickel Silver-828, because of the low temperature of application, excellent control, and the simplicity of joint and jig design needed for efficient production. Since the low temperatures do not melt the steel, the weld metal is very easily controlled, and there is no need for skilled manipulation of welding rod and flame, as in fusion welding. In addition, there is less tendency to distort the work because of the low temperatures used and the excellent ductility of the weld metal.

Simple jig design. In most cases the joints are of such size that they can be made in a single step by heating from one side only. This simplifies jig design and reduces handling operations.

Savings in joint preparation. The molten braze-welding alloys easily bridge the gaps resulting from poor fit-up, and readily build up smooth fillets to develop maximum joint strengths. The cost of joint preparation is minimized since there is no need for accurate fit-up.

Flame fluxing. A widely used adjunct to braze-welding operations is a vapor-fluxing device, installed in the fuel-gas line, to supply a uniform small amount of flux through the flame. In this way, the joint surfaces are protected from oxidation just as soon as heating is started, and the braze-welding operation is expedited through complete fluxing, increased weld fluidity, less tendency to fume, and elimination of separate fluxing operations.

For More Information. Anaconda distributors will gladly help in the selection of the exact rod for your job. Or write for a copy of new Publication B-13. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 67111

File cabinet panel of #18 gage mild steel has corners braze welded with Anaconda-997 Rod. Revo-File Co. gets 14 superior welds in 7 minutes.

ANACONDA®

WELDING RODS

Made by

The American Brass Company

School furniture. With Anaconda-997 Rod, Peabody Seating Co. gets 18 well-shaped braze welds for each chair in about 8 minutes.

Circle No. 7 on Reader Service Card.

PROBLEM

copper's high thermal conductivity makes

TWO TORCHES ARE BETTER THAN

SOLUTION

these four simple steps will help even inexperienced operators do the job

POOR mechanical properties make copper fall short as an engineering material. But for many applications, such as chemical, hospital and processing, copper is an ideal material because of its superior resistance to corrosion.

Fabricating copper by welding requires special procedures because of the mtal's high thermal conductivity (three times that of steel). This means high heat input must be localized in the weld area.

To help operators get the feel of welding copper, here's how a typical job—fabrication of a chemical vessel—was done.

Preparation for welding consists of beveling rolled plate ends to obtain full-depth weld penetration. For this 9/16-inch thick material, beveling is done by hand or air chipping methods. Result is a single vee (80° to 90° included angle) and a narrow lip.

Joint is fluxed top and bottom with a recommended copper flux, and both ends clamped to insure good alignment. Tacks, 2 to 3-inches long, are made near joint ends to provide initial strength to compensate for inherent weakness of copper at temperatures near welding heat, and to prevent formation of shrinkage cracks at seam center.

For best control of molten metal, seam is positioned for downhand welding slightly uphill. Two operators are required to develop the needed heat concentration. One, topside makes the actual weld; the other supplies extra heat needed and draws the molten metal through to the underside of the joint with a heating torch.

Copper filler rod of the same composition as the base metal is applied by an oxy-acetylene welding torch using a neutral flame.

The entire weld is completed in a single pass for best results. Particular attention is given to torch and filler rod angles. Torch angle ought to be about 35° from vertical, while filler rod is held almost vertical.

Peening immediately after completing weld is an essential part of the process. This treatment, done with a flat-nose tool and suitable support underneath, relieves shrinkage stresses developed during welding and produces a good surface finish.

The editors wish to thank Mr. F. Tibbenham, director of Suffolk Iron Foundry, Ltd., England, for supplying material and photos.

concentration of welding heat a problem

ONE WHEN YOU WELD COPPER

BEVEL EDGES to about 85° included angle. Clamp and tack ends.

WELD UPHILL. Be sure to hold torch 35° from vertical and filler rod vertical.

USE HELPER to get needed extra heat and draw metal through the joint.

PEEN WELD to relieve stresses and give joint good surface appearance.

NEW PRODUCTS

Neoprene Contact Wheel

A new contact wheel which is said to increase abrasive belt life as much as 40 percent has been developed by Minnesota Mining and Manufacturing Co., for use on backstand grinding and polishing operations. The "X" wheel available in a 14-inch diameter with 1, 2, 3, and 4-inch face widths, and in several durometers, features a new type serration which provides wide lands for long wear and a high degree of conformability.

Circle No. 150 on Reader Service Card.

TURNING ROLLS

Illustrated is the new M-15 Portable Pipe Rotators recently introduced by Reed Equipment Division of The Webb Corporation.

These units, consisting of one variable

speed powered rotator and one idler rotator, are used to rotate pipe and cylinderical shapes for flame cutting and welding operations.

M-15 unit capacity is 1500 lbs. total load. Fixed wheel center design permits handling pipe sizes from 2 to 24-inches without adjustment.

Circle No. 151 on Reader Service Card.

1000-AMPERE WELDER

A new 1000-ampere a-c transformer welder designed primarily as a power source for the submerged arc process has been announced by the General Electric Company's Welding Department.

With an operating range of 325 to 1000 amperes, the new single-phase welder has motor driven current control. By means of a plug and receptacle, remote control of both welder output and primary contactor is available, in addition to permanently mounted controls.

Circle No. 152 on Reader Service Card.

PORTABLE SPOT WELDER

A new spot welder incorporating advantages such as extremely high welding current for its size . . . easy one-hand operation that reduces operator fatigue . . . easy adjustable spring pressure, etc., has been announced by Aro Spotwelder Division, Guthery Machine Tool Corp. Designated Aro Model P-166A, new welder also offers the convenience of a built-in "trip-switch."

Circle No. 153 on Reader Service Card.

FILTRATION UNIT

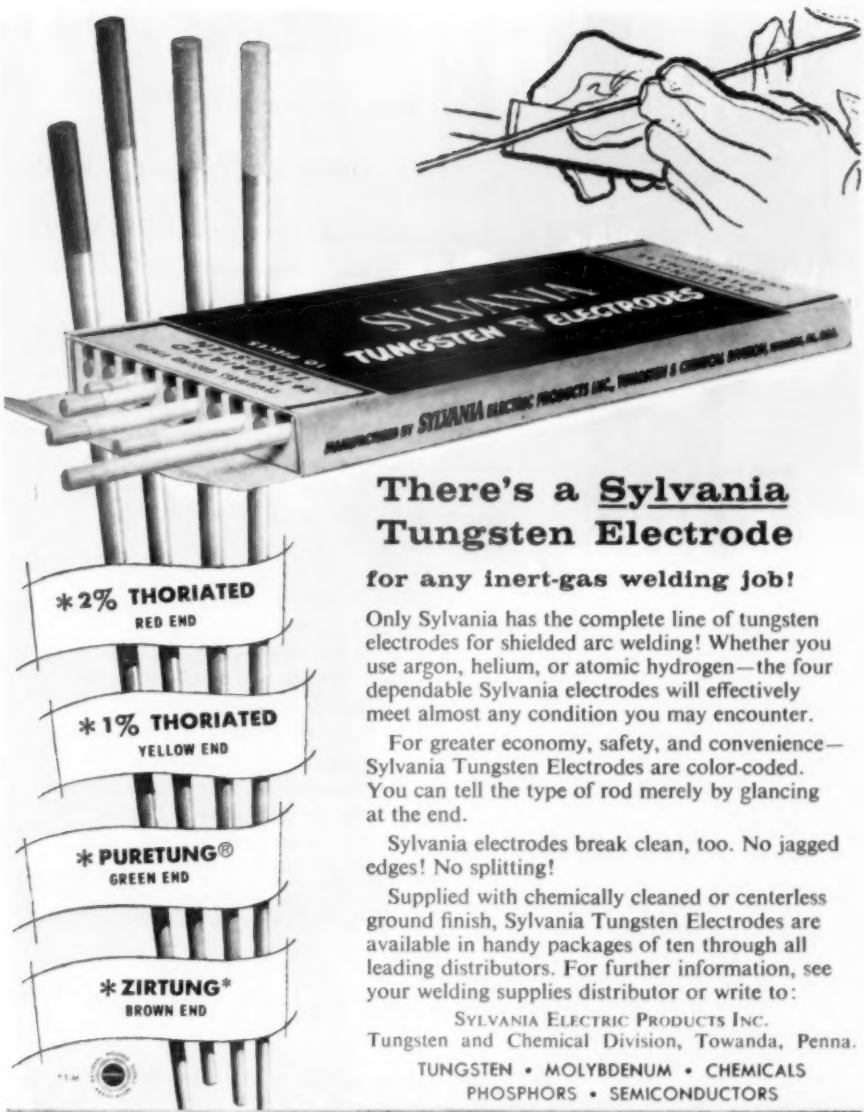
Heico, Inc., has introduced a new water filtration unit. Lower operating and maintenance costs result from use of pure water, and welder cooling lines are kept free of matter that causes clogging. Cartridges can remove impurities to 0.1 micron at 3-10 gallons per min.

Circle No. 171 on Reader Service Card.

ALUMINIZED ASBESTOS CLOTH

A new fire protective cloth, Kamklad, consisting of tightly woven asbestos cloth surfaced with aluminum foil, is said to reflect over 90% of radiant heat according to Keasbey and Mattison Co., its manufacturers. Cloth can withstand more than 125°F heat and will repel sparks and corrosion.

Circle No. 174 on Reader Service Card.



There's a Sylvania Tungsten Electrode

for any inert-gas welding job!

Only Sylvania has the complete line of tungsten electrodes for shielded arc welding! Whether you use argon, helium, or atomic hydrogen—the four dependable Sylvania electrodes will effectively meet almost any condition you may encounter.

For greater economy, safety, and convenience—Sylvania Tungsten Electrodes are color-coded. You can tell the type of rod merely by glancing at the end.

Sylvania electrodes break clean, too. No jagged edges! No splitting!

Supplied with chemically cleaned or centerless ground finish, Sylvania Tungsten Electrodes are available in handy packages of ten through all leading distributors. For further information, see your welding supplies distributor or write to:

SYLVANIA ELECTRIC PRODUCTS INC.
Tungsten and Chemical Division, Towanda, Penna.

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NEW PRODUCTS

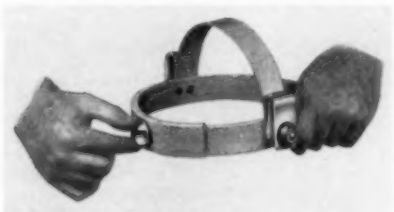
STAINLESS ELECTRODE

Champion Rivet Co. has introduced a new stainless electrode designated as the 16-8-2 for welding stainless types 316 and 347, used in high-pressure high-temperature piping systems. The weld deposit are claimed to have extremely high hot ductility that insures freedom from cracking.

Circle No. 154 on Reader Service Card.

NEW HEADGEAR

Chicago Eye Shield Company has announced a new CESCO G1-R Headgear for helmets and face shields. Available in high-impact vinyl compound or fiber



material, headgear permits easy and comfortable fitting. It adjusts to the required head size by a mere turn or two of the adjusting ratchet.

It is now available on all CESCO welding helmets and face shields.

Circle No. 155 on Reader Service Card.

USE THE READER SERVICE CARD FOR VALUABLE REFERENCE DATA

LOW-TEMPERATURE FLUX

For soldering alloys with melting points down to 150 F, a new type of non-corrosive soldering paste has recently been developed by American Solder & Flux Co. "AMCO No. 261" is free of chlorides and rosin compounds, active at very low temperatures and is said to have long life. Cleaning action begins at about 150 F and continues up to the melting point of regular solder. It is claimed as effective at higher temperatures as a more corrosive flux would be.

Circle No. 156 on Reader Service Card.

WELDING CLOTHING

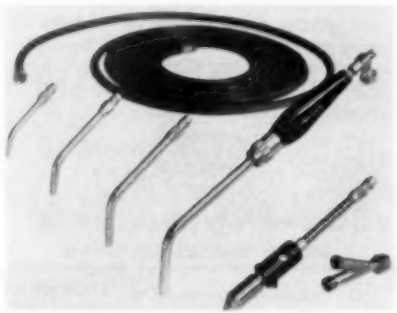
Comfortable, lightweight, new clothing for the welding equipment operator, "Neo-Nylon," is available as a 3-piece outfit (cape, bib and sleeve) from Robin W. Adair, Inc. Its toughness resists both sparks and wear, and weight is cut in half.

Circle No. 14 on Reader Service Card.

AIR-ACETYLENE TORCH HANDLE

A new torch handle for Prest-O-Lite air-acetylene outfits has been announced by Linde Air Products.

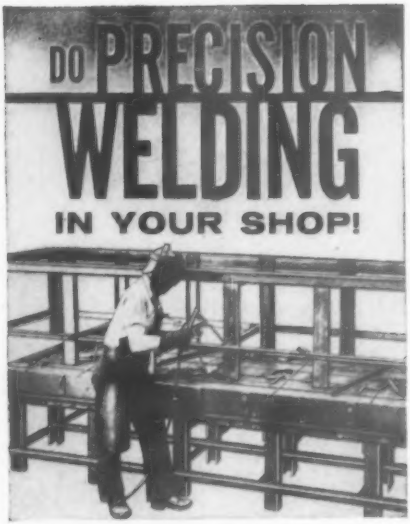
Model No. 403 torch handle is equipped with a needle valve to meet the requirements of those who prefer a valve



at the rear of the handle and have no need for a pilot flame.

Small, light, and comfortable to use, Prest-O-Lite Air-Acetylene torches are said to give intense heat on the spot—without pumping or priming. Typical outfit with new No. 403 Torch Handle is shown.

Circle No. 157 on Reader Service Card.



Enter the growing field of precision welding. It can offer a savings over other methods of assembly . . . broaden the scope of your operation . . . cut costs . . . increase profits. The ideal unit for this type work is the Challenge Precision Welding Table. It's suitable for accurate layout work, "tack" welding and final welding operations. It's equipped with T-slots to permit accurate positioning and holding of the work. Made of a special analysis semi-steel, designed to withstand the welding flame or arc. Guaranteed accurate to within .002". Available in three sizes.

SE-103

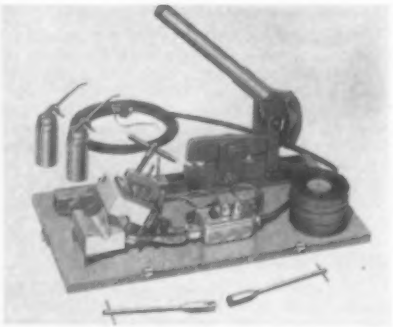
Challenge
TRADE-MARK ®

The Challenge Machinery Co.
GRAND HAVEN, MICHIGAN

The Challenge Machinery Co. IW-6
Grand Haven, Michigan
Please send complete information on Challenge Welding Tables and other Precision Surface Equipment.
Name_____
Company_____
Address_____

Circle No. 18 on Reader Service Card.

NEW PRODUCTS



CABLE SPLICING KIT

Vulcanized, neoprene insulated cable splices, said to prevent power loss, can now be produced anywhere, in five minutes, with a new portable Cable Splicing Kit manufactured by Cam-Lok Division of Empire Products, Inc. The 110-volt kit is said to make permanent cable splices which are flexible, waterproof and shockproof.

Included in the kit is crimping press, cable cutter and vulcanizing mold.

Circle No. 158 on Reader Service Card.

WELDING POSITIONERS

A new line of bench-type welding positioners has been announced by Stahl Equipment Co. Positioners come in three models with torque ratings of 25, 100

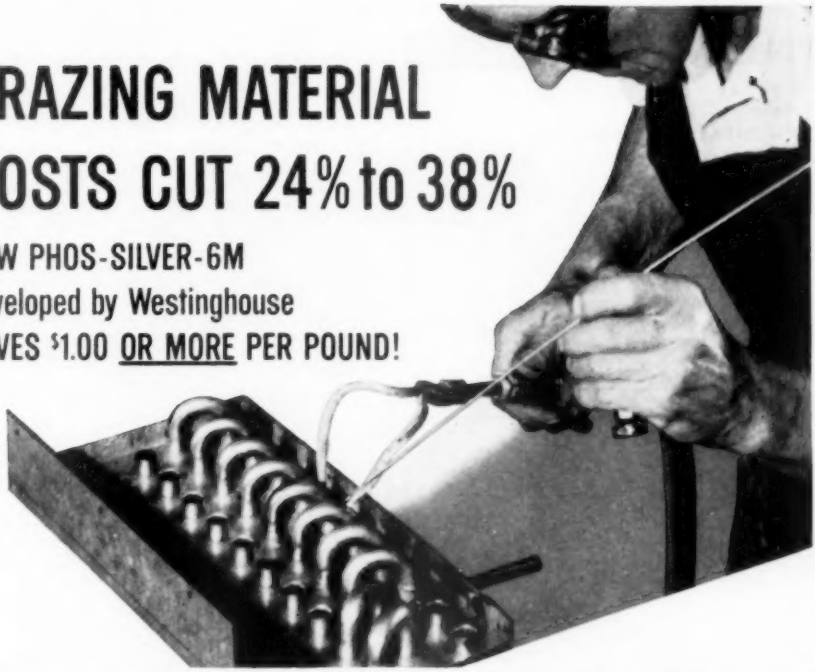
and 250 inch-lbs. and HP ratings of 1/75, 1/10 and 1/6 respectively.

Available extras include hollow spindle, precision speed control, free wheeling, electric tachometers and power tilt.

Circle No. 74 on Reader Service Card.

BRAZING MATERIAL COSTS CUT 24% to 38%

NEW PHOS-SILVER-6M developed by Westinghouse SAVES $1.00 OR MORE PER POUND!



There is now a brazing alloy *proving* itself *superior* to brazing materials costing *3 to 4 times as much!*

It is the new Phos-Silver-6M—made by *extrusion* methods!—*blanketed* under *inert gas!* This eliminates the oxides that cause most brazing troubles. And produces *new versatility* in a brazing rod, with *exceptional* flow characteristics, *remarkable* ductility, and *unsurpassed* appearance of the finished work!

Moreover, Phos-Silver-6M (as *all* the new Westinghouse alloys), has been proved throughout stringent laboratory and shop tests, toughest production runs! Then, is now ANALYSIS CERTIFIED!—*assuring you* the *same consistent, best possible* brazing results!

Order *trial* packages *now!* You'll *standardize* on Westinghouse Brazing Materials *tomorrow!* J-22082-A

YOU CAN BE SURE...IF IT'S

Westinghouse

This exclusive Westinghouse Seal *"guarantees"* you the correct formulation of every rod!

Convenient packaging, 18" lengths, 1-lb and 5-lb tubes. Standard 25-lb package, 36" lengths.

Select from the Westinghouse MOST COMPLETE LINE OF BRAZING MATERIALS IN THE INDUSTRY!

Phos-Copper®, Phos-Silver #2, Phos-Silver®, Phos-Silver-6M, Phos-Silver-15. These round, extruded rods give approximately 20% *more feet per pound* than square rods of the same diameter! (Same alloys also available in rod form, wire in coils, or rings.)

***POWER-UP* with Westinghouse *advanced* brazing materials!**

Trade-Mark

Circle No. 96 on Reader Service Card.

NEW PRODUCTS

FLEXIBLE TOOL SHAFT

The Stow Mfg. Co. has recently marketed a flexible tool shaft that is an ideal lightweight portable production tool for drilling, grinding, sanding, buffing and brushing. It consists of a core rotating inside a rubber-covered casing and is furnished with a ball-bearing motor connection and handpiece with removable wheel arbor. The shaft can be connected to any motor by attaching connection to the motor and can transmit 0.5 hp at up to 6900 rpm.

Circle No. 160 on Reader Service Card.

BRAZING ALLOY

A new form of American Silver Co.'s brazing alloy is now available as "Braze-Clad N." It is supplied in a predetermined thickness of silver brazing alloy on one or both sides of a pure nickel base and is particularly useful for high-temperature applications in stainless steel honeycombs, electronic tubes, jet aircraft and nuclear structures. The alloy can be blanked, stamped, rolled or bent and will not crack or peel from its base.

Circle No. 161 on Reader Service Card.

PATENTED

OXO

SAFETY REGULATORS

AMERICA'S LEADING INDUSTRIES ARE BUYING THESE REGULATORS FOR ONE REASON . . .

They are the Best!

Regulators for Every Need

OXO EQUIPMENT CO.

CEDAR and OAK STREETS
NEW LENOX, ILLINOIS

Circle No. 62 on Reader Service Card.

WELDING HEAD MANIPULATOR

Air Reduction Sales Company has announced a new welding head manipulator and control console for longitudinal and circumferential welding. Unit

was designed to mount either tungsten inert gas or metal inert gas automatic welding heads for universal positioning and accurate variable speed traverse.

The electrical console provides all the necessary controls for complete programming of the welding operation.

Circle No. 159 on Reader Service Card.

COMPRESSORS

The new CT series of compressors has been made available by Atlas Copco Pacific, Inc. Included are the CT-4 (45 hp and 175 cfm) and the CT-6 (75 hp and 340 cfm). Features include minimum floor space and weight, air-cooled operation, long life and low initial cost. Both models are 2-stage single-acting units that develop rated capacity at 970 rpm.

Circle No. 172 on Reader Service Card.

Circle No. 17 on Reader Service Card. →

Wherever you see this name...

someone is saving time, money and doing a better job of CUTTING OR WELDING

When you specify BURDOX for your welding and cutting requirements, you choose the least costly, highest quality and most adaptable process or product for the job. Because BURDOX has the *right* equipment for *all* types of welding and cutting applications, BURDOX gives you practical . . . unbiased answers on "how" to use "what" products "where" for the best results at the lowest cost. BURDOX engineers are expert welding men who offer you the benefits of years of experience with all types of welding and cutting equipment on all types of welding and cutting operations. Get acquainted with the many BURDOX services available by sending coupon for FREE catalog TODAY!

Every Product . . . every Process to fit every Purpose *Best*!

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MAIL COUPON TODAY!

THE BURDETT OXYGEN CO.

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PLANTS:
Cleveland, Dayton, Findlay, Mansfield, Youngstown, Ohio and Los Angeles California

BRANCHES:
Akron, Cincinnati, Columbus, Ohio

NEW PRODUCTS

HYDRAULIC BENDER

Greenlee Tool Co. has introduced Model 880, a lightweight 15-ton bender whose aluminum and heat-treated construction makes it easy to transport and set up. It consists of two sections (2-speed hydraulic pump and bending ram) linked with a 6-foot section of high-pressure hose that can be easily disconnected with a speed coupling. The bender can be used on pipe, tubing, bus bars and conduits.

Circle No. 162 on Reader Service Card.

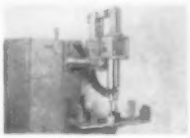
FIBRE GLASS FACE SHIELD

Presented as the first with a fibre glass spark guard is a new face shield developed by Sellstrom Mfg. Co. Use of fibre glass is said to eliminate the moisture- and heat-absorbing characteristics that distort or destroy ordinary face shields. Featured are larger window area, 8- or 10-inch window height, ratchet adjustment for proper fit and green or clear shades.

Circle No. 163 on Reader Service Card.

SPOT-PROJECTION WELDER

A new roller head press type combination spot and projection welder has been announced by Allied Welder Corporation.



Advantages claimed for new welder include; space saving, versatility through being able to install arms at right or left of centers as required, easy adjustment to give up to 30-inches throat depth and direct connection of transformer to lower arm support which eliminates change of current characteristics when arm is raced or lowered.

Units come in 1000 psi and 2300 psi sizes in KVA ratings from 30 to 150.

Circle No. 164 on Reader Service Card.

THE *Finest* in LIFTING . . . and POSITIONING CLAMPS

The gripping cam is actuated by pull on the lifting shackle. This increases gripping power as load becomes greater. Manual operation of locking lever causes clamp to snap lock on plate or assembly and snap open for easy removal.

Safety Lock Snap CLAMPS

Free: Illustrated 14 page catalog.

- The only clamps with a safety lock
- Maximum speed and safety
- Lock on in any position
- Lock off in any position
- Cannot be accidentally knocked off
- Replaces welded pad eyes and screw clamps
- Exceptionally light in weight
- Safety factor 5 to 1
- From 1 ton to 20 ton sizes
- The toughest clamp ever built
- Made of finest grade tool steel

Attractive territories available to qualified distributors, dealers and representatives. Write for details.

J. C. RENFROE & SONS, INC.

1259 W. STATE STREET • JACKSONVILLE 1, FLORIDA

Circle No. 66 on Reader Service Card.

WHY *triple-guard* WELDING GOGGLES?

MODEL 492

1. Outside Protection
SOFT-VINYL form-fit FRAME — black opaque . . . hugs contours of face and nose, closes all gaps against light and other eye hazards.

2. Direct Eye Protection
50 mm GLASS Federal Specification FILTER LENSES . . . absorb harmful ultra violet and infra red rays.

3. Inside Protection
Inside Cover Lens protects eyes from splinters if impact breaks filter lens.

plus **STAC-VENT light-tight VENTILATION**

Quality Eye Protective Equipment *Made by the Leaders in Plastics*

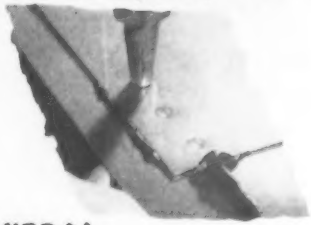
WATCHEMOKET OPTICAL CO., INC.

232 West Exchange St. Providence 3, R. I. In Canada: Levitt-Safety Ltd., Toronto 10, Montreal 26, Winnipeg

Circle No. 90 on Reader Service Card.

WATER-TIGHT... CORROSION-FREE SEAMS with

PARWELD SPOTWELD SEALER



EXTRA!

- Weld button blow-back eliminated.
- High-speed gun application.
- Low resistance that saves current and time.
- Electrodes may be used in contact with sealer without freezing or pitting.

Try a sample at our expense!

THE PARR PAINT & COLOR CO.

18353 Syracuse Ave., Cleveland 10, Ohio

Circle No. 64 on Reader Service Card.

NEW PRODUCTS

INDUCTION HEATING

New self-contained, two station work table designed to perform hardening, brazing, annealing and soft soldering operations has been introduced by Welduction Corporation. Standard units are equipped with 220/440 three-phase motor generators available in ratings from 7½ to 30 KW. Work table has an output of 220 volts, 10 KC, single phase. Unit comes with meters indicating electrical functions, "heat on" and "generator on" lights and "open sight" visual check of cooling waters.

Circle No. 165 on Reader Service Card.

POWDERED SOLDER

Johnson Mfg. Co., Inc. has announced a series of compounds made of finely powdered solder suspended in flux. Designated "Flux-'N-Solder," it is applied by dipping or brushing and then heated by flame, induction or hot plate to complete the job. It speeds sweat or assembly soldering and tinning or solder coating. Available in both 1-lb cans and production-sized containers.

Circle No. 166 on Reader Service Card.

STUD WELDER

Designed and built by Dix Engineering Co., Inc., a new automated 4-stud projection welder reduces costs of manufacturing. Unique features include ability to hold close tolerances (±0.012 in. between stud centers), an automatic unloading and part turnover device which feeds the welded part to premachining inspection and ease of lubrication (12 lubrication points serviced from grouped fittings).

Circle No. 167 on Reader Service Card.

Think you'll ever need
A-power fittings like these?

TUBE-TURN® Stainless Steel Elbows – heavy wall thickness for nuclear energy reactor.

Name your piping problem...

TUBE TURNS CAN HELP YOU!

No matter what kind of welded piping system you build . . . here's how Tube Turns can be of help:

Tube Turns' line includes 12,000 *standard* welding fittings and flanges, plus thousands of *specials* such as the A-power fittings shown above. When you buy from this *complete-line* leader, you get what you need *promptly* . . . products of unsurpassed *quality* . . . backed by experienced *engineering service* . . . for reliable, *low-cost piping*. Order from your nearby Tube Turns' Distributor.

"TUBE TURN" and "tt" Reg U.S. Pat. Off.

The Leading Manufacturer of Welding Fittings and Flanges

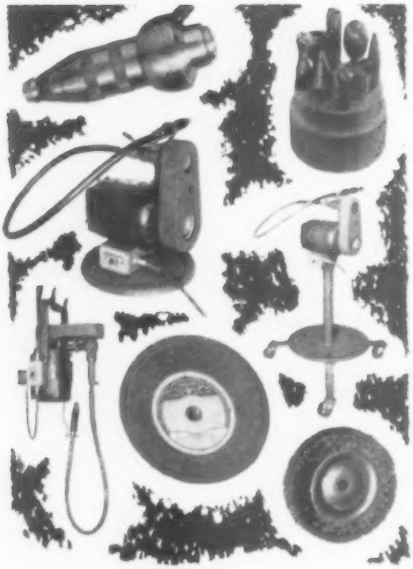
TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Detroit • Atlanta • New Orleans • Houston • Midland Dallas • Tulsa • Kansas City • Denver • Los Angeles • San Francisco • Seattle

In Canada: Tube Turns of Canada, Ltd., Ridgetown, Ontario • Toronto, Ontario • Edmonton, Alberta

Circle No. 83 on Reader Service Card.



everything you need from start to finish

Remember, when you're checking specifications and selecting equipment, don't fail to consider Haskins flexible shaft machines and accessories. Haskins' complete line of equipment insures faultless performance on your *special* and *standard* metal-working operations — *without interruptions.*

Whether you're grinding, wire-brushing, filing, whatever the job, a start with Haskins will carry you through from the beginning right down to a perfect finish. Our three models, bench, pedestal and suspended mounts, plus a multiplicity of metal-working tools, enable you to achieve faster production, lower labor costs and a superior finished part! Find out about the versatile line of Haskins flexible shaft machines and accessories—*leaders in their field for over 30 years.*

Write Today for a Catalog and Literature

R. G. HASKINS Co.

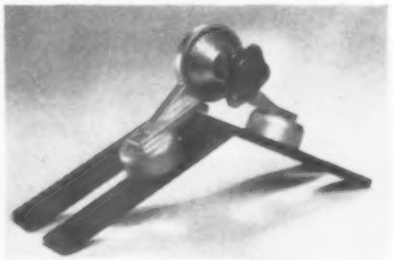
2653 W. Harrison St. Chicago 12, Ill.

Circle No. 36 on Reader Service Card.

NEW PRODUCTS

ANGLE HOLDER

A new magnetic angle holder, "Permatin," is manufactured in Switzerland and distributed by National Cylinder Gas through Emanuel S. Klausner, Inc., of New York City. Of rugged metal con-



struction with a plastic knob for angle selection, the holder has circular magnetic clamps at either end and a graduated scale for setting the desired angle of clamp. Angles may be measured from 0 to 180 degrees.

Circle No. 168 on Reader Service Card.

C-CLAMP

A new development in Grand Specialties Co.'s C-clamps is a ratchet screw that instantly positions or releases the screw. Features include added strength, throat depth up to 6 in., copper plating

Circle No. 169 on Reader Service Card.

USE THE READER SERVICE CARD FOR VALUABLE REFERENCE DATA

SAFETY SPECTACLES

New industrial spectacles known as "Magnasite" have been produced by American Industrial Safety Equipment Co. Features include larger viewing area, frames of clear plastic, minimum weight with resistance to impact, 4 lens and 4 bridge sizes, choice of lens color and clip-on shields.

Circle No. 170 on Reader Service Card.

Give ALL wearing parts longer life with Colmonoy hard-facing

Whether that fast wearing part that causes you so much trouble is shown here or not, Colmonoy hard-facing alloys can give it new longer-than-before life. Colmonoy alloys protect against every form of wear, are applied with electric-arc or oxy-acetylene equipment, or with the Spraywelder (really the only economical way to hard-face cylindrical parts).

HARD-FACING & BRAZING ALLOYS

WALL COLMONOY CORP.

19345 JOHN R STREET · DETROIT 3, MICHIGAN

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WRITE RIGHT NOW

For the Colmonoy Spraywelder Catalog and Hard-Facing Manual No. 79

Circle No. 89 on Reader Service Card.

recapping the highlights:

A.W.S. WELDING SHOW

changing the guard:

C. P. SANDER, president-elect, receives gavel of office from outgoing president, John J. Chyle.

honor to the old guard:

COMFORT AVERY ADAMS, founder and first president of A.W.S., receives portrait from C. T. Pierce, New York Shipbuilding Co.

AMERICAN Welding Society members were honored at the Society's Adams National Meeting held in Philadelphia early in April. Five national and 18 regional awards were presented. The meeting was held in conjunction with the Fifth Welding Show held at Philadelphia's Convention Hall. More than 100 companies participated in the show which drew a record attendance of well over 10,000 guests.

Fred L. Plummer, Director of Engineering, Hammond Iron Works, Warren, Pa., was named as winner of the Samuel Wylie Miller Memorial Award. The honorary medal and certificate was presented to Mr. Plummer for his outstanding contributions in the application of welding to storage tanks and to the advancement of engineering technology in the shop and field fabrication of welded structures.

This year's Adams Lecturer was DeWitt C. Smith, Chief Metallurgist, Harnischfeger Corp., Milwaukee, Wis., who was presented with a certificate and honorarium upon the presentation of his special paper on the subject of the welding of ultra high strength steels. The lecture is named after the founder and first president of the American Welding Society.

Honorary membership in the Society was awarded Mr. O. B. J. Fraser, Assistant Manager, Development and Research Div., International Nickel Co., New York. The award was made for exceptional

MEETING IS BIGGEST EVER

accomplishment specifically in connection with the joining of nickel and nickel alloys. Mr. Fraser, formerly President of the Society, has also served the Society in many other capacities.

The 1957 Lincoln Gold Medalist is Jay Bland, Project Engineer, Engineering and Research Dept., Standard Oil Co. (Ind.), Whiting, Indiana. The award, donated by J. F. Lincoln, Lincoln Electric Co., is granted the individual who has written the paper judged to be the best published in the *Welding Journal*.

The National Meritorious Service Award went to A. N. Kugler, Chief Welding Engineer, Air Reduction Sales Co., New York. The award was given for outstanding service Mr. Kugler has rendered the American Welding Society for many years.

New officers for the 1957-1958 fiscal year were elected and introduced to the Society's membership at the opening session.

New president of the Society is Clarence P. Sander, Los Angeles, Cal. Mr. Sander is general superintendent, Vernon plant, Consolidated Western Steel Div., United States Steel Corp. He previously served as first vice president of the Society.

Other new officers are:

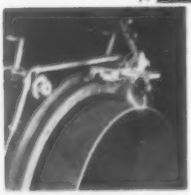
First Vice--President — Gustav O. Hoglund, Head Welding Section,

continued on next page

Circle No. 35 on Reader Service Card.

Torch control

SHAPE-CUTTER



OUT-OF-ROUND

Pat. No. 2408517

FOR PERFECT CUTS AND BEVELS

Patent Applied For:

The new H & M Out-of-Round features greater accuracy, simplicity and ease of operation in cutting pipe, where the circumference of the pipe is of imperfect shape.

The H & M Shape Cutter makes the most complex intersectional cuts precise and accurate by using a proven pattern or templet.

In both cases, the torch is forced to follow a predetermined course that you *know* is perfect.

H&M PIPE BEVELING MACHINE COMPANY

TM REG.

Tulsa, Oklahoma
311 E. Third St. Diamond 3-0241

NEW A.W.S. OFFICERS

Alcoa Process Development Laboratory, New Kensington, Pa.

Second Vice-president—Charles I. MacGuffie, Manager of Marketing, Welding Dept., General Electric Co., York, Pa.

Treasurer—Harry E. Rockefeller, Manager Electric Welding, Linde Air Products Co., New York, N. Y.

New directors-at-large are:

James F. Deffenbaugh, Chief Electrical Engineer, Federal Machine & Welder Co., Warren, Ohio; Alfred E. Pearson, Chief Welding Engineer, Ingalls Iron Works Co., Birmingham, Alabama; Clarence M. Styer, Pacific Car & Foundry Co., Seattle, Washington; and, Robert M. Wilson, Jr., welding specialist, Development and Research Division, International Nickel Co., New York, N. Y.

District directors are:

New England (District 1)—Sidney Low, supervising engineer, Research & Development Lab., Chapman Valve Mfg. Co., Indian Orchard, Mass.

Comfortable NEW Clothing for Welding Operators

HERE IT IS ▼ the new "NEO-NYLON" 3 piece Cape-sleeve-bib

Yes! One-half the weight and really tough. Resists wear and sparks. Remove sleeves or bib for every use. Can be repaired, too.

Write us direct or see your safety supply distributor.

RACO PRODUCTS DIVISION
ROBIN W. ADAIR CO., INC.
AVOCA, NEW YORK

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North Central (District 3) — Harry E. Miller, Chief Manufacturing Engineer, Coil Div., Carrier Corp., Syracuse, N. Y.

West Central (District 7)—Alfred F. Chouinard, Manager, Research and Development Dept., National Cylinder Gas Co., Chicago, Ill.

Southwest (District 9) — Percy V. Pennybacker, Supervising Field Engineer, Bridge Div., Texas Highway Dept., Austin, Texas.

Northwest (District 11)—Charles B. Robinson, Supervising Welding Engineer, Air Reduction Pacific Co., San Francisco, Cal.

UNITED SPECIALTIES APPOINTMENTS

Appointment of Hugh O. Weatherford as sales manager has been announced by R. C. Morrison, executive vice-president and general manager of United Specialties, Inc. Mr. Weatherford was formerly factory representative working out of the El Dorado, Arkansas, plant.

Other recent appointments include Ray Hammel Co., Los Angeles, California; J. G. Ward & Associates, Inc., Portland, Oregon; and Porter Littell Sales Co., Denver, Colorado, as manufacturer's representatives.

"FLUX-WELL"

Welding Fluxes

No. 1—WELDING FLUX
For Cast or Malleable Iron

No. 2—BRAZING COMPOUND
For Brass, Bronze, Steel Brazing

No. 4—ALUMINUM FLUX
For Cast or Sheet Aluminum

No. 5—BRAZING COMPOUND
For Cast or Malleable Iron

Write for Free Folder!

Weld Rod Division

THE CHICAGO HARDWARE FOUNDRY CO.

NORTH CHICAGO, ILL.

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THERMO Spiral

—the ONLY Tip Cleaners that GUARANTEE These OUTSTANDING Advantages

- Accumulated carbon and slag removed without scratching or enlarging orifice.
- Left-hand spiral ridges clean and burnish old tips to new tip efficiency.
- Have no breakage points caused by grooves running horizontally.
- It's the ONLY Tip Cleaner with uniformly rounded cleaning ridges.
- Locked in compact case to prevent damage. Standard set of 12 cleans 27 drill sizes.
- Send for a FREE THERMO Spiral Tip Cleaner TODAY and prove to yourself it can't be broken in normal use.

All Progressive Welding Supply Dealers stock THERMO Tip Cleaners

THERMACOTE Company

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PASADENA
CALIFORNIA

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last of a series for your shop notebook ❯

THE SHORTHAND OF WELDING

That the application of arc welding to highly stressed structures requires strict control was recognized early by the American Welding Society. Because of this need for welding specifications, the Society established a set of welding symbols which fabricators of metals have accepted as standard.

Used by designers, these symbols show the welding operator correct size, type and amount of weld to be made at each location. The responsibility for correct weld design is placed in the hands of the designer who should have complete information as to the weldment's functions, including stresses and any special service conditions.

This information leaves the operator free to pay close attention to use of proper welding procedures. He is only responsible for making welds in accordance with the symbols indicated on the blueprints from which he works.

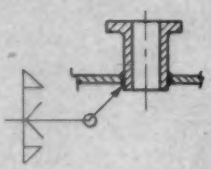
To make sure the operator keeps weld sizes in line with those called for it is a very good idea to equip him with a weld measuring gage.

bites off a bigger payload . . .
MANGANAL
T. M. REG. U. S. PAT. OFF.
11%-14% MANGANESE STEEL
WING DING
INDIVIDUAL SLIP OVERS
STULZ-SICKLES CO.
SOLE PRODUCERS
PORT AVE. at JULIA ST. · ELIZABETH, N. J.

Circle No. 75 on Reader Service Card.

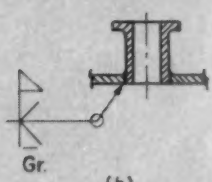
COMMON SYMBOLS FOR TANK WELDS

Nozzle in Shell (Extended thru)



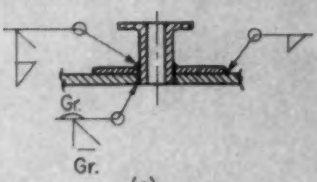
(a)

Nozzle in Shell (Ground Flush Inside)



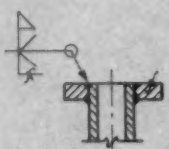
(b)

Nozzle in Shell – Reinforcing Ring Added.



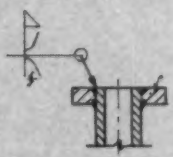
(c)

Plate Flange to Nozzle Machined



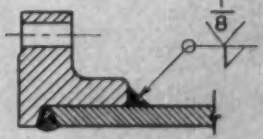
(d)

Plate Flange to Nozzle (J Grooves) Machined



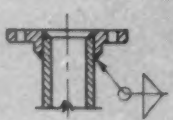
(e)

Hub-Type Flange to Connecting Body (Flush Inside)



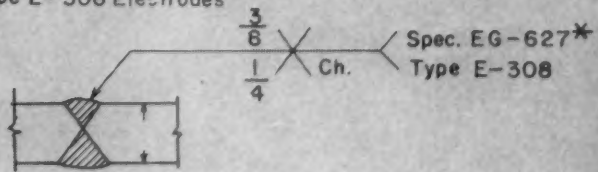
(f)

Hub-Type Flange to Connecting Body.



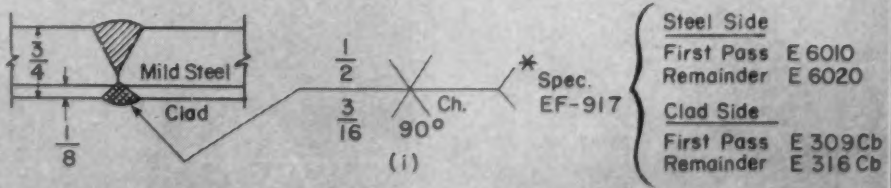
(g)

Spec. EG-627 Stainless Steel Type 304 (SA-240, Gr.S)
Type E-308 Electrodes



(h)

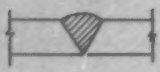
Spec. EF-917 Chrome-Nickel Steel Clad Plate (SA-264 Gr.II)
(Stainless Steel Electrodes Types as Noted)



(i)

* Company weld specification

WELD FINISH AT PLATE SURFACE



Standard reinforcement
No additional finish.

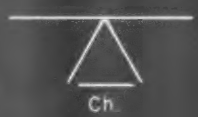
Standard reinforcement requires no additional supplementary symbol

Weld deposit - Flush
No additional finish

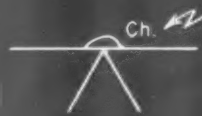
Standard reinforcement
Grind smooth but not flush.

Standard reinforcement
Grind flush.

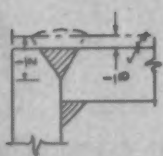
Same as above, but chip flush.



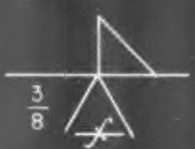
Back chip before final final finish bead.



Symbol on side to be back chipped.



Machine finish after welding.



Symbol specifies final weld size after machining. Bevel prepared as required, making allowance for finish.

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180, 250 Amps. models (below)

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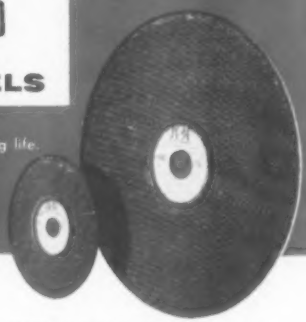

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brazed stainless steel honeycomb structures give high strength-to-weight ratios and resistance to supersonic heats

BRAZING HELPS BUILD ROCKETS AND MISSILES

by G. JEWETT CRITES
consultant

THE advancements made in the science of rocketry and missile research pose a problem. Engineers of the aircraft companies must find a material which has a high strength-to-weight ratio and can stand the high temperatures caused by atmospheric skin friction.

These materials will be exposed to temperatures ranging from 600°F to 800°F which are encountered at speeds of Mach 2 and Mach 4. Such speeds soon will be reached in powered flight and will undoubtedly be surpassed by some of the ballistic missiles.

To date, the most promising material is welded stainless steel honeycomb cores to which are brazed face sheets and closeouts. A welded honeycomb core is a structure made up of stainless steel foil one to three thousandths of an inch thick. This foil is formed in such a manner that, by resistance welding adjacent nodes, a structure closely resembling a honeybee's product is obtained.

Cells of this material may be hexagonal, square or of some other shape. Core dimensions run from $\frac{3}{16}$-inch cell to ¾-inch cell with depths ranging up to nine-inches or more.

At present many components of the newer aircraft and missiles include adhesive bonded honeycomb of aluminum or stainless steel. There are also small areas of brazed stainless steel honeycomb on such ships as the B-58.

Other metals under consideration for use in honeycomb structures include titanium, 17-7 PH steels and AM-350. Other metals, including mild steel, many tool steels, 18-8 stainless and hardenable chrome stainless, have been tested and found unfit for one reason or another.

The honeycomb structure with which we are dealing consists of a honeycomb core of welded stainless steel or titanium foil to which the skins and attaching members are fastened. At present, brazing

users report some degree of success

Retort brazing uses protective retort in which part and its tooling are placed. Retort in turn is put into conventional high temperature furnace.

Hot wall vacuum brazing is done by placing part and its tooling in a high vacuum retort which in turn is enclosed in an electric furnace. Cooling is done by removing furnace from around the retort or by moving part—still under vacuum—from hot section of retort to a cooler one.

In cold wall vacuum brazing heating elements and their insulation are contained in a water-cooled vacuum chamber. Part and its

STAINLESS STEEL is used in this prototype structural aircraft beam of high temperature brazed all-metal honeycomb sandwich

seems to be the most promising method of fabricating these structures.

Brazing alloys being studied melt at 1600°F to 2000°F. Rule of thumb consideration in choosing these alloys requires that their melting point be approximately twice the operating temperature.

High on the list of these materials comes silver-manganese, either as a binary alloy or containing small amounts of such elements as lithium, nickel, chromium, iron, cobalt, copper, etc. The alloy chosen must have good wettability and corrosion resistance and must not adversely affect the strength of the parent metal by intergranular penetration.

As if finding one such alloy were not problem enough, fabrication techniques require the development of a complete family so that multiple stage brazing can be done.

The process of brazing of honeycomb structures has been approached from practically every conceivable angle. It must be borne in mind that the materials used have excellent strength and

has been obtained with each of these eight brazing methods:

tooling are placed within this chamber. Cooling is done by circulating an inert gas which conducts heat to the water-cooled walls.

Induction brazing uses a high frequency induction coil that directly or indirectly heats part to brazing temperature. Suitable methods of protecting part from atmospheric contamination are used.

Electric blanket brazing uses conduction heating. In this method, part, protected by an inert gas contained in a thin metal retort, is placed between ceramic plates into which electric heating elements are recessed.

Blow torch brazing subjects parts to direct products of combustion of an oil or gas-fired furnace. Part is placed in a protective foil retort.

Radiant lamp brazing brings part to brazing temperature by using new high energy quartz lamps backed by suitable reflectors. Suitable protective atmosphere must be provided.

Salt bath brazing method is of minor importance because of size restrictions and because cellular structure of honeycomb core does not lend itself to easy clean-up.

oxidation resistance at 600°F to 800°F, but are quite reactive at higher temperatures and so must be protected during brazing operations.

Some of the brazing methods now under study include retort brazing, hot and cold wall vacuum brazing, induction brazing, electric blanket brazing, blow torch brazing, radiant lamp and salt bath brazing.

Majority of these methods have had some degree of success. The one with the most promise seems to depend upon just which company or company division is making the claim. It is significant that the most publicized brazed stainless steel honeycomb parts, those used on the B-58, are mainly produced by the retort method.

One reason for the wide spread use of this method is that existing furnace equipment can be adapted to it. All of the other methods require more extensive expenditures for new equipment. This is particularly true in the case of vacuum brazing. However, many of the advantages of vacuum brazing are causing its rapid adoption.

Advantages of vacuum brazing are three fold. First, the vacuum affords an excellent protective atmosphere. Secondly, brazed joints made are generally stronger than those made in inert or hydrogen atmospheres. This fact can be explained by the almost complete removal of absorbed gases from the work surface by the action of the

vacuum. Finally, the vacuum furnace does away with the use of the complicated retort and the cost of inert gases.

The brazing operation itself is practically as complicated as the equipment in which it is done. Fit-up of the material to be brazed must be almost perfect to assure a good product. Gaps of from three to five thousandths of an inch are the maximum allowable.

Considering some of the parts which must be brazed, it becomes apparent that achieving such fits between contoured honeycomb core and stretch formed or taper machined skins is easier said than done. The closeouts or edge members are particularly fussy because the braze here must be perfect since these members transfer the stresses of the completed plane or missile.

At present, much work is being done on the problems of machining the core, forming the skins and assembling the various attachments. Unfortunately, the method is still a tweezer and nail file, cut and try operation.

There are problems besides those of fitting of core material, skins and MORE closeouts prior to brazing. For maximum strength, the web of the core must be normal to the skin. This is easy enough with flat or simple curved sections but becomes quite complex when compound curvatures are encountered. In this, ingenuity provides a way to meet the production requirements.

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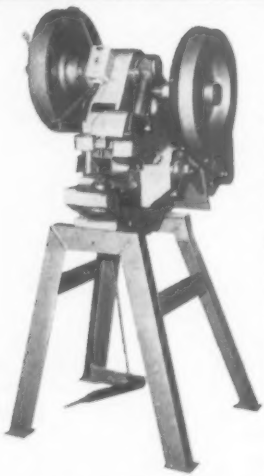

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One company, High Temperature Products, Inc., Santa Monica, California, is said to have developed a process which insures a perfect fit of all of the components to be brazed as well as proper orientation of individual cell walls. For production parts, this new process should result in economies of both weight and cost.

As difficult as the fit-up problem is, it pales into insignificance when one considers the tooling problem. Most of the brazing alloys dealt with melt in the 1600°F to 2000°F range. Therefore, it is necessary to accurately support the delicate core and then skins in intimate contact at these temperatures. The fact that most metals have the strength of a "wet noodle" and also have an unfortunate tendency to warp and grow at temperatures above 1800°F makes the tooling problem even more perplexing.

Refractory materials, such as graphite, ceramics and silicon carbides, are being used. However, the difference in thermal expansion between these and the part itself makes further compromise necessary.

At present the most common tooling technique is the use of a partially evacuated metal foil bag surrounding the part. Tooling then can be either inside or outside of this bag. High vacuum brazing is also tooling in a similar manner by utilizing high vacuum within the bag and a partial pressure on the exterior. The thermal expansion problem is minimized by restricting the dimensions of the part.

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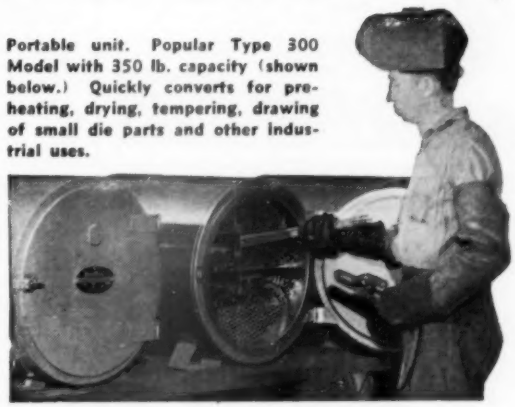

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POSITIONEERING

PART 13

how positioning can increase production

by **CHARLES N. ARONSON**, *President*
Aronson Machine Company

TO bring out just how much time can be saved through positioning let's take a simple case: an open-top box, 30-inches high, 30-inches wide and 55-inches long. Made of one-inch steel plate, box weighs 1846 lbs.

For comparison, use the following welding speeds as standard for the positions given: vertical fillet, 4.5 ipm, and vertical butt, 4.0 ipm; horizontal fillet, 10.0 ipm, and horizontal butt, 8.0 ipm; downhand fillet, 12.0 ipm, and downhand butt, 14.0 ipm; 10° downhill downhand fillet, 19.2 ipm, and 10° downhill downhand butt, 21.0 ipm.

Fillet welds total 278-inches and butt welds total 286-inches.

Non-positioned welding would have the weldment transported by crane to the weld site and placed on horses so the bottom butt welding would not be too close to the floor. If the weldment was not moved until it was completed, the operator would walk around it, and the job would break down like this:

Horizontal fillets: 162-inches at 10.0 ipm—16.2 minutes; vertical fillets: 116-inches at 4.5 ipm—25.8 minutes; horizontal butts: 170-inches at 8.0 ipm—21.2 minutes and

vertical butts: 116-inches at 4.0 ipm—29.0 minutes. Total welding time is 92.2 minutes.

All-horizontal welding could be accomplished by keeping the crane on tap and getting rid of the horses. As the box rests on the floor—open side up—horizontal fillets would be run. Then the crane would roll it over on one side so two of the erstwhile vertical fillets would be run as horizontal fillets. And so on. Here's how it breaks down:

Delivered on bottom: 162-inches of horizontal fillets at 10.0 ipm—16.2 minutes; craned 90° on side, 58-inches of horizontal fillets at 10.0 ipm—5.8 minutes; on side, 113-inches of downhand butt welds at 14.0 ipm—8.1 minutes; craned 180° on other side, 58-inches of horizontal fillets at 10.0 ipm—5.8 minutes; same position, 113-inches of downhand butt welds at 14.0 ipm—8.1 minutes; craned 90° on end, 30-inches of downhand butt at 14.0 ipm—2.1 minutes; craned 180° on other end, 30-inches of downhand butt welds at 14.0 ipm—2.1 minutes. Total arc time is 48.2 minutes. Weldment is then craned 90° on

continued on next page

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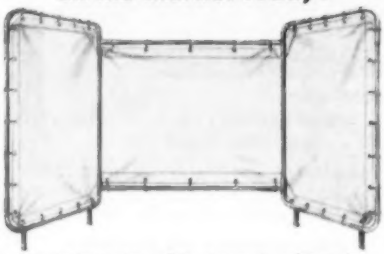

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SPECIAL FLUX
FOR GENERAL BRAZING
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bottom for removal from weldshop.

You have noticed we do not now have any horizontal butts; because they are now on top, they become downhand butts and are welded at 14.0 ipm. To obtain this arc time reduction we have had to keep the crane on tap at all times so we could use it the five times we needed it to get the positions used. If this were a study of machine time and costs, then we would have to count the time the crane was idle, especially if there was an operator. But this is a study of production, getting the work done, so we will count only the time the crane is actually in use.

Experience has shown that changing positions by use of the crane for a weldment like ours requires 5 minutes per change as an average. Thus, 25 minutes producttime time was used to get the positions we needed in order to do the welding in 48.2 minutes. Total time to produce the weldment all-horizontal is 73.2 minutes. This is a net increase in production of 26 percent.

Downhand welding all of the joints requires the use of the crane and appropriate props. A set of Vee horses to place the box into the

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fillets and on the floor for the butts would provide all downhand welds. Total arc time would then be 43.58 minutes, with 11 crane moves at 3 minutes each, or 33 minutes of crane time.

It takes 3 minutes per crane move instead of 5 because these moves are mostly only 45°. Since there are a lot of these moves, efficiency will be higher. As it is, 43.58 minutes arc time plus 33 minutes crane time totals 76.58 minutes. All downhand welding gained 4.62 minutes arc time and lost 8 minutes crane time. Compared to non-positioned, we stepped up production to 126 percent for all horizontal and to only 120 percent for downhand. We have lost ground. But, if we are going to wrestle the weldment around anyway, why not have all the welds 10° downhill downhand?

Downhill downhand welding would be the natural thing because it requires only that the Vee horses be of slightly different heights. There are 278-inches of fillets and 286-inches of butts to be welded. The crane moves would be the same.

continued on next page

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But weld speed would be 19.2 ipm instead of 12.0 ipm for fillets and 21.0 ipm instead of 14.0 for the butts. Fillets would then require 14.48 minutes and butts 13.62 minutes. Total arc time for downhill downhand is 28.10 minutes. This is a saving of 15.48 minutes in welding time.

Crane time will still be 33 minutes, so total production time is now 61.10 minutes. Compared to non-positioned this an increase of 51 percent in production through the very simplest positioning.

Thus, the first part of the question, "Why Position?", is adequately answered.

If this primitive method of positioning increased production, what can we do if we use a machine created for the purpose. This is the answer to second part, "Why Position with Positioners?"

FOR VALUABLE FREE DATA SEE PAGE 32

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WELDING NEWS

continued from page 20

A.W.S. CHARTERS TWO NEW SECTIONS

With the chartering of two new sections, one in New Hampshire and the other in North Carolina, the American Welding Society now has 80 active sections throughout the United States.

The Carolina Section, with headquarters in Raleigh, N. C., was formed to serve the needs of AWS members in North Carolina. It is the seventy-ninth section of the Society.

A charter as the 80th AWS section has been granted to the 50 members of the New Hampshire Section with headquarters at Manchester, N. H.

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Chicago Eye Shield Company has appointed the Car-Mad Equipment Company, with offices at 608 Palm Avenue, as its distributor for the state of Florida. Carl L. Ploch heads this newly formed distributorship.

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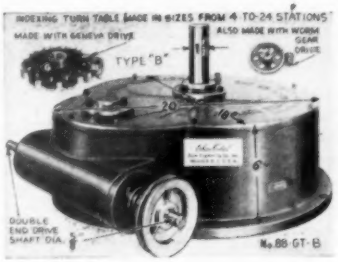
INDEXING TURN TABLE MADE IN SIZES FROM 4 TO 24 STATIONS
MADE WITH GENEVA DRIVE
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TYPE "B"
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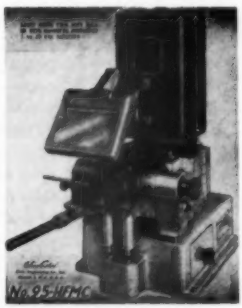
CAMS

BUTT WELDERS



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SPOT WELDERS

DR. CHAS. EISLER, M.E., Founder • CHAS. EISLER, Jr., Pres.

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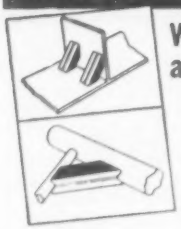

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SOUTHERN OXYGEN CO. OPENS ATLANTA OFFICE

Southern Oxygen Co. announces the appointment of W. W. Whitley as District manager of its new Atlanta office. Formerly only a medical supply outlet, the Atlanta office now has entered the welding equipment and supplies field, covering Georgia, South Carolina and northern Florida.

Mr. Whitley comes to the Atlanta office with an extensive background in welding and sales. For the past 8 years he has been a welding sales engineer located in the company's Philadelphia District Office.

For Valuable Reference Material Available At No Charge
See Page 32

Heavy-Duty

WELDING AND CUTTING EQUIPMENT

DURABLE Alexander Milburn welding and cutting equipment is designed for heavy-duty applications.

COMPLETE Alexander Milburn line includes "packaged" kits, wide range of tips and torches, accessories and supplies.

GUARANTEED Alexander Milburn products provide complete protection against defects of workmanship.

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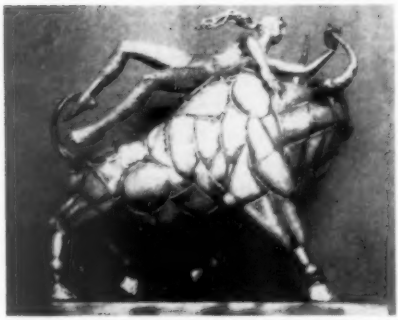
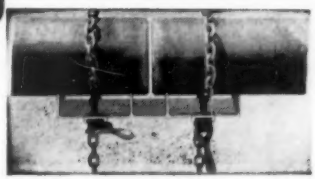


WELDED SCULPTURE

A young Cuban sculptor who taught himself to use an oxy-acetylene welding blowpipe to create his works was a big attraction at the recent A.W.S. Welding Show in Convention Hall, Philadelphia. He is Ernesto Gonzalez. Featured at the Linde Air Products Company's exhibits, he demonstrated his ultra-modern technique.

Dynamic little bronze figures of animals and humans were presented to lucky visitors. Sample shown above was created from bronze welding rods and enameled copper. Oxy-acetylene flame was used to obtain tone gradations and unusual textures.

JEWEL PIPE CLAMPS



For fast, Accurate Pipe Welding. Sturdy construction for hard usage. Aligns and holds pipe for tacking. Two sizes: ½" to 8" and 8 to 16".

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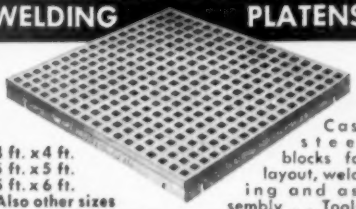
BENDING BLOCKS or WELDING PLATENS



4 ft. x 4 ft.
5 ft. x 5 ft.
5 ft. x 6 ft.
Also other sizes
Write for information

Cast steel blocks for layout, welding and assembly . . Tools, stands, accessories.

ACORN IRON & SUPPLY CO.

Delaware Ave. & Poplar St., Philadelphia 23, Penna.

SPEED UP WELDING

with Superior's "Aircrafter" POSITIONER & TURNTABLE

WEIGHS 20 POUNDS

HOLDS WORK IN ANY POSITION FROM VERTICAL TO HORIZONTAL

BENCH MODEL

LOW IN PRICE BUT HIGH IN QUALITY

Complete with Foot Control. Smooth speeds forward and reverse from Zero to 7 r.p.m. and more; can handle work up to 100 lbs. For precision work with Heliarc, Arc or Gas welding also brazing and soldering. Write for complete details to—

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Strong, light weight, easy to clean—with fiber or all plastic, ratchet-type head gear.

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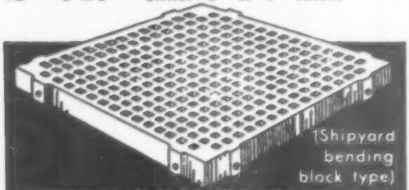
WELDING and SET-UP PLATENS

Floor plates — bending tables — layout tables — straightening tables — dog blocks — bending blocks — blacksmith blocks. 5' x 5' — 6' x 6' — 6' x 8' — 6' x 10' — 5' x 10' — 6' x 12' — 3' x 3' — either 6" or 7" thick.



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Individually Power-Tested for Better Performance

The most complete line of clamps. Stock sizes from ¾ in. to 12 tt. openings ⅛ in. to 16 in. deep.

WRITE FOR FREE CATALOG

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1985 Waverly Ave., Cincinnati 12, Ohio

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APPOINT JUDGES FOR STUD WELDING AWARDS

Dr. Donald S. Clark, president of the American Society for Metals, has announced the names of the four welding authorities who will serve with him in judging entries in the first annual $1500.00 Gregory Award Competition for the most significant contribution in the field of stud welding. They are William H. Schuster, American Car & Foundry Div.; J. H. Weigel, Combustion Engineering, Inc; Dr. Robert D. Stout, Lehigh University, and R J. Griffin, Department of Navy, Bureau of Ships.

The deadline for entries in the competition is midnight June 30, 1957. Information on the competition may be obtained from Gregory Industries, Inc., Lorain, Ohio, manufacturers of Nelson stud welding equipment.

RESISTANCE WELDING SHIPMENTS SHOW SUBSTANTIAL INCREASE

Statistics compiled by the Resistance Welder Manufacturers' Association for the month of March indicate that shipments for that month increased nearly 40 percent over February shipments.

Shipments again considerably exceeded $3 million, making March the seventh month out of the last nine when this figure was reached.

LANKENAU JOINS PURITY

Well known to welding people in Western Michigan, Clarence Lankenau has joined Purity Cylinder Gases, Inc., Grand Rapids, Michigan. Announcement was made by Purity's Edward Butterfield.

Before joining Purity, Lankenau was associated with National Cylinder Gas Co.

OPPORTUNITIES

Rates: $25 per column inch. $10 per column inch for "Position Wanted" ads. Payment must accompany order.

California welding supply distributor expanding—needs inside and outside salesmen. Metropolitan center; best lines. Reply stating background and experience. Address all correspondence to Box 6157, INDUSTRY & WELDING Magazine, 812 Huron Rd., Cleveland 15, Ohio.

ENGINEER WANTED

Age, 28 to 33, with experience in the gas welding, cutting and pressure regulator fields to assume duties as assistant chief engineer in the design of new products and the development of new manufacturing processes. Established, growing Cleveland manufacturer of gas welding and cutting equipment.

Send complete resume indicating salary desired to Box 6257, INDUSTRY & WELDING Magazine, 812 Huron Rd., Cleveland 15, Ohio.

ALLOY RODS OPENS SALES OFFICE IN HOUSTON

Alloy Rods Company, York, Pennsylvania, manufacturer of welding electrodes, recently announced the opening of a new sales office and warehouse in Houston, Texas. The new facilities are located at 2201 Dallas Avenue in Houston.

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SPEED-X Welding Positioner

THREE MODELS AVAILABLE . . .

Model 25: 25 in-lbs torque 1/75 HP
Model 100: 100 in-lbs torque 1/10 HP
Model 250: 250 in-lbs torque 1/6 HP

Special requirements such as hollow spindle, precision speed control, free wheeling, electric tachometers, power tilt, etc., are available.

STAHL EQUIPMENT CO.
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REDUCE CLEANING COSTS WITH

NO-SPAT ***WELDING FLUID***

Fixtures, weldments and surrounding surfaces are kept free of spatter. Costly chipping and grinding is eliminated. NO-SPAT is non toxic, and also suppresses fumes, generated by welding! NO-SPAT prevents rust and it conditions metal surfaces for painting! Some users coat entire metal equipment with NO-SPAT for maximum ease of welding, rust prevention, and paint conditioning. Shipped ready to use.

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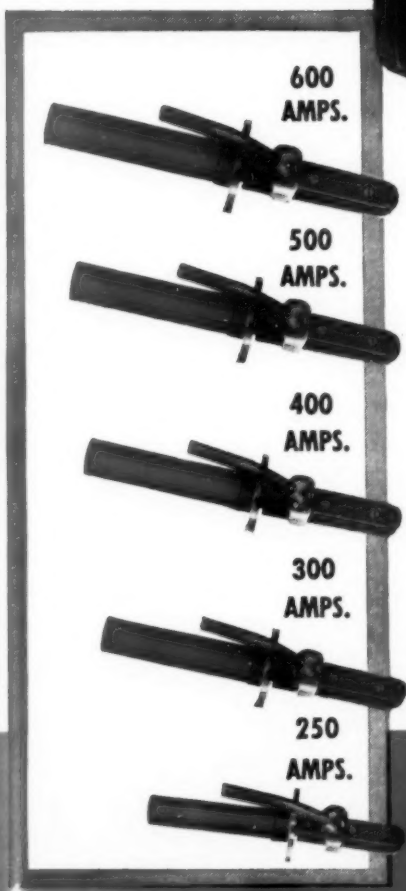

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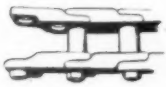

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Inherent high speed cuts welding time; deep cone confines spatter loss; slag is easily removed. No. 255 contains 13% manganese, 5% nickel; deposited hardness of 250-285 Brinell, work hardening to over 500.

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